RAILROAD GAZETTE

FRIDAY, MARCH 20.

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Contributions.

Cost of the Pintsch Light Equipment.

The Safety Car Heating & Lighting Company,
NEW YORK, March 12, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your interesting editorial of March 7, on Mr. Gibbs' very valuable paper on Car Lighting, in the comparative table, the cost of Pintsch equipment per car is given as $552. This includes a very large charge on account of gas works. I would respectfully call your attention to the case of the Erie Railroad, which for a number of years has been able to supply a large proportion of all its equipment from a single gas works at Jersey City. The output of gas from these works is equivalent to the supply of 500 cars, equipped as Mr. Gibbs specifies, and the average charge per car on account of works would be about $40, and the first cost of equipment complete would be $297, instead of $552. In Mr. Gibbs' paper the cost of a gas works for 500 cars is given as $15,500 or $31 per car, which would make the cost of car equipment still lower.

Where railroads can be supplied with gas from our central stations now established, and to be established, there need be no charge against car equipment for cost of works. The cost for equipment per candle power would in this case be $1.51.

ROBT. M. DIXON, *Engineer.*

Reducing Valves and Steam Heating.

NEW YORK, March 13, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of even date, under the caption "Two Railroad Presidents on Steam Heating," you say in connection with the reducing valve: "Therefore a reducing valve that would stop the flow of steam if the spring broke should be used. Such a valve is to be had. *But the reducing valve is not essential.*"

We shall have to take issue with you upon this point. We insist that a reducing valve which will automatically regulate the pressure to a train pipe, regardless of any change of the initial pressure, or of any demand made upon the train pipe, is essential to *any* system of steam heating. With a simple throttle valve the delivery pressure and heat will vary as the boiler pressure varies, and if all outlet valves should be closed at any time the discharge pressure would quickly accumulate, with the result, not of scalding passengers, but of bursting hose and blowing off connections.

It is well understood that both the engineer and fireman of modern trains have enough to attend to and look after without adding the further responsibility of watching a gauge indicating the pressure on the heating pipes.

J. M. FOSTER.

[If Mr. Foster will read the editorial again he will find that there is no issue between us, except that he ignores the safety valve as a part of the equipment.—EDITOR RAILROAD GAZETTE.]

Screw Stay Bolts.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Apropos of the discussion at the New England Railroad Club on "Screw Stays for Locomotive Boilers," I send you the following memoranda regarding some points not reached there:

The screw stay bolt is coeval with the water-surrounded furnace; though in some cases a thimble has been used with a long rivet through it, riveted on the outer and inner side of the furnace sheets. With a few exceptions the screw stay has been used on the four sides of all locomotive furnaces. The most notable exceptions are the locomotives designed by Edward Bury, who was at one time Locomotive Superintendent of the London & Birmingham, now a part of the London & Northwestern.

These locomotives possessed several peculiar features, one of which was the absence of hanging or crown stays, the crown of the furnace being supported by its hemispherical form; another feature was the absence of screw stays between the inner and outer sheets of the furnace except at the front. The furnace being "D" shaped, the sides and back were supported by their circular form. The call for increased grate area soon rendered this form of furnace impracticable. Several of the Bury locomotives were imported into New England in 1834, where they were in service many years with a full measure of success.

With the early locomotives, and their shallow furnaces, there was but little trouble from broken stay bolts; but as a depth of 60 in. was reached they were quite common, and more so when the furnaces were of copper.

As the fuel used was wood, the fire was out and the steam off several times a day, according to the nature of the service; thus increasing the number of vibrations caused by unequal expansion and contraction of the plates. In the furnaces of the old locomotives the water spaces were narrower than in those of later design; this made the strain on the stays more severe. With coal as a fuel, broken stays were at first less frequent. This was probably due to the longer stay and the continuous heat in the furnace, the fires being kept from day to day, thus decreasing the number of vibrations. The pressure now carried on many boilers, and the bad form of sheets made necessary by the use of larger boilers, calls for special attention to the screw stays, and some improvement in their form and treatment.

The distance between the screw stays varies from 3 to 4½ in., according to the pressure carried and thickness of sheet used; the practice in this regard differs with different builders. But as stays are broken by strains other than tensile, this difference of areas in proportion to loads sustained is sometimes considered of minor importance, except that the small areas between bolts will admit of the use of small stays, which will better dispose of the vibrations. A sufficient cause for these vibrations is found in the difference in the temporary expansions of the sheets, and to this may be added the difference in the permanent contractions. Wrought iron suffers a permanent contraction from repeated heating and cooling and steel boiler plate contracts much more. A strip of steel boiler plate 5 ft. long, after repeated heating to a dull red and then slowly cooling, became measurably shorter.

The leakages at the mud rings in some furnaces shows the existence of a tendency to drive out the fire-box and strain the screw stays. The expansion of the sheets will assert itself, and some means should be found to prevent, if possible, the evil effects on the stays.

The car axle in its original form was a straight, round bar, and the vibration, centering close to the hub of the wheel, caused it to break there. Later practice made it smaller in the middle, which changed the breaking point from near the hub to near the middle. Later still, the axle was formed with a quick taper from a point near the hub, leaving about 36 in. of the length much smaller than the wheel fit, and experiments showed that the number of vibrations which the two latter forms would stand before fracturing bore a close relation to the respective lengths of the small parts.

In the case of the screw stays all the vibration centres near the sheets, where they must finally break. Years ago the practice was quite common to reduce the stays between the sheets to a diameter a little below the bottom of the thread, and with good results, as, when put in among others of the plain form, those reduced at the middle held, while those of the full size gave way. Let history repeat itself. It may be said that to reduce stays at the centre would be expensive, but broken stays are expensive also.

OBAN.

Rapid Transit for New York City.

BY THEODORE COOPER.

We are all agreed that the city of New York needs more and better rapid transit facilities. As to the proper means of obtaining the "more" we are at variance, being classified into advocates for some variety of high or low viaducts, shallow or deep underground subways. Our experience with the existing rapid transit facilities has made clear to all of us how they could be bettered. We want seats ready for us whenever we enter a train. We must have stations located so as to suit our individual desires. We want fast trains, avoiding useless stops (always provided that these stops are made at points individually satisfactory to us). There must be no noise, smoke or dirt, but plenty of light and perfectly sweet, fresh air, properly warmed in cold weather. Upon these points we are unanimous. Some of us, in addition, insist that there shall be no more elevated railroads, not only because they occupy the streets, but they also offend our sense of the beautiful.

Now, we are practically agreed upon the main features of the "better" accommodations we desire and that we need "more." It only remains for us to agree upon the proper system to be adopted.

It is unfortunate that, after we have settled upon the proper system, the execution of our desires will require the employment of a large capital. For people who have been sufficiently economical to have saved up more or less of their earnings are not governed solely by philanthropic motives in spending the same. They are not willing, as a rule, to place these earnings in the hands of promoters of necessary schemes of public improvement until the bankers and capitalists, acting as their agents, are ready to assure them that the scheme is a sufficiently good one to insure the safety of their funds and to give them a proper return in the way of dividends and interest. Any scheme, therefore, which we may decide upon as the more and better rapid transit method must be scrutinized by the cold-blooded capitalists before the money can be obtained for carrying it into execution. Hence, before selecting the particular system, it would be well to prepare our facts ready to put before these capitalists, and also to satisfy ourselves that our claims are reasonable and attainable. We can do this in either of two ways:

1st, the usual method. Prepare estimates of cost of construction and equipment, and then assume with more or less plausibility the data in regard to the prospective traffic, earnings and operating expenses. With properly-selected data, we can show the excellence of the investment.

2d method. Take the existing system of rapid transit, with the mass of facts on record, and determine what results are likely to occur by our desired modifications in the methods. If we can determine within reasonable bounds, the amount of the net revenue which can be earned in handling properly the existing traffic, it will define the amount of capital that can be expended with a prospect of suitable earnings. We consider the latter method of investigation most likely to reach the truth, and will employ it.

The Manhattan system for the fiscal year ending June 30, 1890 (Report of Railroad Commissioners): Handled, 185,833,632 passengers, and made 7,683,520 train miles, upon a length of double track railroad of 32.4 miles, with 9.34 miles additional of third track, and 15.96 miles of sidings and turnouts, representing a total single track mileage of 90.10 miles.

The system earned a net revenue, after deducting operating expenses and taxes, of $4,081,552.07.

Now let us see what effect the new requirements for our better system would have upon these earnings:

1st. Every passenger must have a seat. This means with the present train service a reduction in the number of passengers to be handled, or else longer trains with the present number of stations, or else longer trains and fewer stations. Longer trains with the present frequent stations would mean slower service, as more time would be required to stop and start the trains. This would not come within our new demands for better accommodations. The reduction of the number of stations would also reduce the number of passengers to be handled. As from 50 to 60 per cent. of the total traffic of the Manhattan system is concentrated into the crowded hours of night and morning, when at least one-third of the passengers are standing up, it is fair to suppose that the traffic would fall at least 30 millions if seats must be supplied all passengers.

As the same train service must be maintained in order to get the maximum traffic, the operating expenses would not be perceptibly reduced, but the earnings would be reduced by $1,500,000, thus reducing the net revenue to $2,581,552.

But, in addition, we must do away with the locomotives and select some better system of haulage in order to avoid smoke and dirt. Public opinion demands electric motors as the future motors for rapid transit. They make no smoke and possess all the merits that the imagination can give to the unknown. It is true, no motors of sufficient capacity to handle such trains as our service, requires have yet been successful; and all the facts obtainable in regard to the operation of the smaller ones, which are considered as successful ones, and those from the larger unsuccessful ones, have not been encouraging. Recent publications of the working of the motors in the new London subway have strengthened the faith of the non-professional public in the electric motor for rapid transit, though they have yet to stand the test of time. This subway has been supplied with an electric plant designed to handle a train of three tram cars, carrying a total load of 100 people, at 20 to 25 miles maximum speed, and the contractors are said to have guaranteed that the haulage of the trains should not exceed a cost of 3½d., practically 7 cents, per train mile. It is very doubtful if this price includes the expense of maintenance and repair of the electric plant, and also whether the result can be accomplished; but we will give them the benefit of the doubt in the following comparisons.

The Manhattan system expended in the fiscal year ending June 30, 1890:

For repairs of locomotives	$242,448.20
For fuel	814,969.32
For oil and waste	69,436.39
For water supply	65,019.93
Total	$1,191,873.84

As they made 7,683,520 train miles, the cost of haulage (including maintenance and repair) would be about 16 cents per train mile. The trains on the elevated railroad are, however, very different things from the trains on the London subway. On this latter road the maximum train consists of three tram cars. The body of each car is 26 ft. long, with seats along the sides like our street cars. The three cars would then have 156 ft. of seating capacity. On the Manhattan the maximum train consists of five Pullman cars with 400 ft. of seating capacity. The Lon-

don subway train seats 100 passengers, or gives 18 in. of seat for each passenger. The Manhattan train seats 240 passengers and gives 20 in. for each seat. The London subway train weighs from 30 to 40 tons. The Manhattan train weighs from 100 to 120 tons. The traffic of a rapid transit road in the city of New York could not be handled by any trains of tram cars. The longer and heavier American system of railroad cars would be needed.

Comparing, then, the cost of haulage on these two roads by the tonnage of the trains, we find that the best claim made for the electric motor, and which claim is yet to be proven, is 50 per cent. higher than the actual cost of haulage by steam upon the Manhattan system. It may be claimed that the speeds are more in favor of the London Subway, but actual facts do not support such claims. The electric engines of the London Subway are designed to run 25 to 26 miles per hour. The locomotives of the elevated railroad do run at these speeds between the stations. The trains on the London Subway make 3½ miles in 15 minutes, making only four intermediate stops. The trains of the Sixth Avenue line run from Rector to Forty-second street, a distance of 3¾ miles, in 20 minutes, making twelve intermediate stops.

If, then, under the best expectations, we must increase the cost of haulage 50 per cent., the net revenue previously obtained, or $2,581,552, must be still further reduced by one-half of the present cost of haulage on the Manhattan system, or $\frac{\$1,191,873.84}{2} = \$595,937$, leaving $1,985,615 as the net revenue to be expected from handling the existing traffic of the several lines of rapid transit by electric motors at the present speeds and with proper seating accommodations for each passenger. This sum at six per cent. would pay interest upon a capital of $33,000,000. As we can hardly expect to realize more than 80 per cent. of this capital stock for actual construction expenses, we must construct and equip the necessary miles of road to do an equivalent business to the Manhattan for $26,000,000.

To equip such a road with an electric plant sufficient to handle the traffic of the existing elevated roads would require an expenditure for real estate, engines, boilers, dynamos, conduits, conductors and motors at least equal to $500,000 per mile of double track. We would not, therefore, be able to duplicate the 32.4 miles of the existing rapid transit lines of this city, and get the desired improvements, with fares of five cents per passenger.

It may be considered unfair to take the whole elevated system as necessary in order to get the same amount of traffic. On the contrary, it should be borne in mind that a new road cannot expect to get, even with the improved facilities, more than a portion of the existing or future traffic. There is also a limit to the number of passengers that can be carried upon any line with comfort. Certain portions of the elevated system are being worked as close to their maximum as can be done with existing facilities. The Third Avenue line is carrying over 40 per cent. of the total traffic of the Manhattan system. It consists of 8.85 miles of double track main line and 10 miles of single track sidings and turnouts, or a total mileage of 27.7 miles single track. In considering this line alone we must bear in mind that, run as an independent system, the general expenses would be very much increased over the portion it now bears as part of a large system.

Operated by the electric motors and the number of passengers limited to these who could be furnished with seats, this line could possibly pay a net revenue of $840,000, which would pay six per cent. interest on a capital of $14,000,000. Eighty per cent. of this as the amount to be devoted to construction and equipment would be $11,200,000, of which $4,425,000 must be devoted to the electric equipment, leaving for the construction of the road, car equipment, stations, machine shops, extra track, terminals, etc., $6,775,000, or about $776,000 per mile of double track, including all sidings, etc.

Considering that the above figures are rather small for many of the proposed new systems and are also based upon the supposition of having a volume of traffic equal to the Third Avenue Elevated Railroad, it does not look like a very sure investment, especially with the possibility of the electric plant proving unequal to the duties demanded of it, and bearing in mind that a plant has not yet been developed capable of handling such heavy and enormous traffic as now operated by the elevated railroad.

That the passenger traffic of the city of New York is growing very rapidly is undoubted, and the time may come when any such new line will have its full share of work. But to satisfy our figures, it must have such traffic as soon as opened or else we must have a greater expected return than six per cent. to make up the loss of interest while building up the traffic.

During the fiscal year ending June 30, 1890, the horse-car lines up and down the island carried, in addition to the 185,833,632 passengers carried by the Manhattan, 149,000,000 passengers; the lines included in the above being the Second, Third, Fourth, Sixth, Seventh, Eighth and Ninth avenues, the Broadway and the Belt Line (largely across-town traffic). As 65,454,720 of the above horse-car passengers were carried by the Second, Third and Sixth avenue lines in direct competition with the elevated railroads upon the same avenues, we could not estimate a very large percentage of this horse-car traffic as seeking a rapid transit route. The new line must therefore compete with the elevated railroads for some years to come for the principal part of their traffic.

Estimates upon the growth of traffic in this city are very doubtful ones, especially when based upon the past and present passenger traffic. The rapid increase in the cross-town traffic and in the short-haul traffic, which cannot be separated from the longer-haul traffic, vitiates all the results as effecting the future of rapid transit. Moreover, much of this traffic is so located that it would not be diverted to any system of rapid transit.

Assume as a basis of comparison that the walking speed of a pedestrian is three miles per hour; the average speed of horse cars, six miles per hour; the average speed of elevated railroads, 12 miles per hour; the average speed of express service, 24 miles per hour.

To cover certain distances by these different methods would require the times given in the following table:

Distance.	On foot.	By horse car.	By elevated.	By express.
½ mile.	10 min.	5	2½	1¼
1 "	20 "	10	5	2½
1½ "	30 "	15	7½	3¾
2 "	40 "	20	10	5
2½ "	50 "	25	12½	6¼
3 "	60 "	30	15	7½
3½ "	70 "	35	17½	8¾
4 "	80 "	40	20	10

According to our assumed pedestrian speed, the distance covered in one minute's time would be 260 ft., or one short block. Now, on the assumption that the conveyance was ready to start upon the arrival of the passenger, a person would gain nothing in time by taking a horse car for a distance of half a mile, if he had to walk an additional five short blocks out of his way to get the car. Nor could he save any time by giving preference to the elevated railroad over the horse car if he must walk five blocks additional for a travel of one mile. Nor could he go out of his way five blocks and save any time by giving preference to the express route over the elevated for a distance of two miles.

No one line can then expect to draw the traffic from other routes beyond certain narrow limits. The smallness of the traffic upon the Second Avenue Elevated, compared to the great volume of the Third avenue line, shows the difficulty of drawing the traffic any distance, even with the better facilities that could be obtained by a maximum walk of two long blocks.

It is a very common expectation that any new system of rapid transit should give higher speeds than we are now getting on the elevated railroads. Let us consider what effect higher speeds will have. The maximum speeds now run on the Manhattan system are from 20 to 28 miles per hour, but the average speed over long distances falls to 12 and 15 miles per hour. This is due to first, loss of time in discharging and receiving passengers at the stations, second, the distance used up in getting the train from a stop to its maximum speed, and third, the loss necessary in bringing the train from full speed to a stop at each station. An increased maximum speed with the present frequent stations would not have much effect in increasing the average, as it would require longer distances to get the train up to the higher maximum and a longer distance to bring the train to a stop, the average speed would not be increased to any great extent. Practically a higher speed means longer distances between stations. To get double the present average speed of the elevated railroads, it is considered necessary by those who have studied the subject to have the express stations from one to one and a half miles apart.

A line of rapid transit which was solely an express route could only expect to get a small portion of the the general traffic, owing to the limited area about each station from which they could draw the traffic, in consideration of the greater distances passengers would have to walk. If three out of every four of the present stations of the elevated railroads were abolished, no one could question that higher speeds could be maintained, but the traffic would undoubtedly fall off to a large extent.

The imposition of a higher fare than five cents would reduce the limited area from which an express route could naturally draw its traffic, on the basis of the same fares as now exist in all the transportation lines, to still narrower limits.

What effect the future development of passenger traffic would have on such lines must be largely conjecture. In time, the increased number of those who could afford the higher fares, and the concentration of those about the express stations, might render such a system a paying one. Such a route, however, would not be rapid transit for the great mass of the traveling public. These would only be benefited to the extent of the relief due to the withdrawal from the cheaper lines of a certain number of passengers seeking the better line.

An express line combined with lines for the more general traffic would appear to be the best solution. Such a line must be four-tracked, and would, for many of the proposed systems, cost nearly twice as much as the double-track road, and in all cases have an increased cost. Higher speeds, therefore, would require an increased cost of construction, undoubtedly in excess of any proportional increase in the traffic.

From the preceding considerations, it would appear that the future of true rapid transit, for the people of New York, which we would define as a comfortable and rapid transfer from one part of the city to another, at the cost of five cents per passenger, for all distances, is not a bright one. It is not necessary to add to our difficulties by considering the trouble and expense of ventilation for any subway system, not the problem of warming the cars on lines operated solely by electricity, without using the car stove.

That we must have more rapid transit, and will have it by some means or other, is certain. If capitalists will not be philanthropic and build and operate for us a system without expecting a suitable return in earnings, we have the following alternatives: 1. The road must be built and operated by the city, with solely an expectation (or certainty) of a suitable return in the increased value of taxable property.

2. And which applies more particularly to roads above the surface, the city must assume all damages or cost for real estate, depending again upon the increased values created by such routes as an offset.

3. The city must make up any deficit due to the operations of any new systems.

4. The law must make provision for an assessment of betterments and awards for damages or loss.

5. Public opinion must be changed so as to permit the extension and increase of the elevated railroad system, as the only system likely to furnish us with the better accommodations and also make a proper return to the investors.

Lubricants for Locomotive Cylinders.

The following extract is taken from an article on lubricants for cylinders and slide valves by Mr. R. Séguela, in the December, 1890, issue of the *Portefeuille Economique des Machines.*

It is well known that the use of vegetable or animal oils (olive, colza and tallow) for lubricating the cylinders and slide valves on locomotives causes a blackish deposit on the cylinder heads and pistons, and in the ports and passages, which is so hard that it must be periodically burned off. Mr. Ricour says that, in the case of locomotives on the State Railroad which were lubricated with colza oil, it was necessary to burn out the exhaust passages after a mileage of about 18,000 miles, or about once a year, to free them from the carbonaceous deposit, formed by the lubricant. The mean thickness of these deposits at the end of a year's service was approximately from .06 to .08 in. on the faces of the piston, .10 to .12 in. on the cylinder heads and on the sides of the steam ports, and from .27 to .35 ins. in the exhaust pipes. At the sharp turns in the exhaust passage at the valve chest, in engines with outside cylinders, the thickness was as much as .07 in. and notably affected the draft, by reducing the area of the passages, and also the speed of the engine.

These deposits are formed of carbonaceous matter, peroxide of iron and oxide of copper. The presence of iron and copper is due to the wear of cylinders and slide valves. An analysis of samples taken from different points showed that the greatest proportion of copper is to be found in the valve chest near the ports and at the base of the exhaust pipe, the weight of copper and iron being nearly equal. In the cylinders and on the faces of the pistons the proportion of copper is reduced nearly one-half. A large proportion of copper is found on the exhaust valves and in the steam pipe. Copper is therefore carried along by the current of steam toward the chimney in ordinary running, and toward the boiler when the engine is reversed.

The weight of copper worn off the valves is about 17.6 ounces per month per engine. About one-tenth of this is to be found in the deposits in the passages; the scale, etc., washed out of the boiler contains from .15 to .3 per cent., and the balance is carried out of the stack by the exhaust steam, as no trace of copper is to be found in the stack or in the smoke box.

Further, when running with the throttle closed, hot gases from the smokebox are drawn in which decompose the oil. In a test in the laboratory of the State Railroad, colza oil was heated to temperatures of from 212 deg. to 536 deg. Fahr. The observed action was, successively, the absortion of oxygen, the giving off of hydrogen, and formation of oleic and stearic acid and separation of glycerine. The glycerine is decomposed at 536 deg. Fahr, giving carbonic acid, acetic acid and acrolein. Such are the reactions which take place in the valve chest and cylinder when running with closed throttle and when the gases drawn from the smoke-box are at temperatures of from 480 deg. to 570 deg. Fahr. By the combination with the iron and copper dust which comes from the wear of the valves and valve seats oleates are formed. At the times when the engine is reversed, the products of the decomposition are driven back into the boiler. The free oleic acid attacks the plates and corrosions are noted on the front tube sheet, in the angles of the fire-box plates, along the joints of the cylindrical shell and in the washing-out pockets.

The use of mineral oils for lubricating the cylinders, combined with the adoption of valves for admitting air when the throttle valve is closed, and piston valves has led to the almost complete suppression of carbonaceous deposits on the walls and in the exhaust passages, and to a very considerable reduction in the corrosion of the boilers. At present all French railroad companies have adopted for locomotive lubrication either pure mineral oil or the same with a slight addition of colza oil, except the P. L. M. Co., which employs pure colza oil for lubricating the mechanism, but uses mineral oil for cylinders and slide valves.

In concluding his article, the author describes experi-

ments made by Mr. M. J. Hirsch, by which it was demonstrated that any greasy coating on the water side of boiler plates seriously impedes the transmission of heat, and that coatings of animal and vegetable oils are particularly apt to produce dangerous heating of the plates.

Cloud's Boltless Wheel.

The latest form of this wheel is shown by the illustrations herewith, in which fig. 1 is a side elevation, fig. 2 a section through hub and rim, fig. 3 a transverse section through a spoke, and fig. 4 a detail of the tire fastener. The tire fastener consists of a plate notched as shown in fig. 4 and placed between the tire and the top of the wheel. Each alternate projection is bent into a groove in the tire, and the other projections are bent around the edge of the rim of the wheel.

Fig. 1.

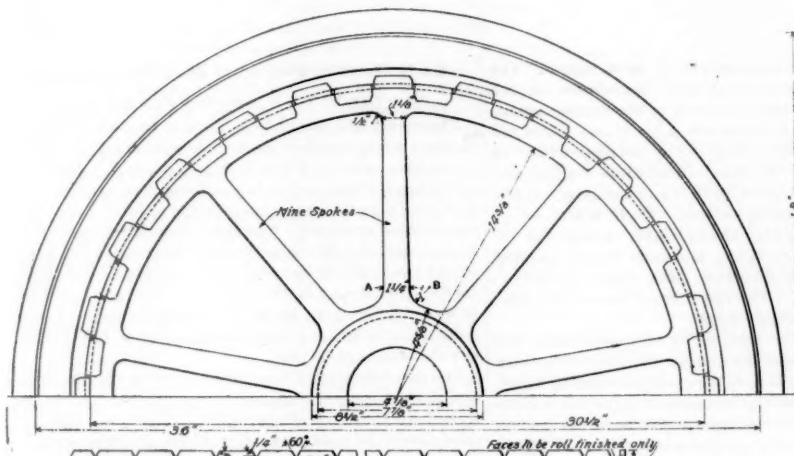


Fig. 4.

Fig. 2.

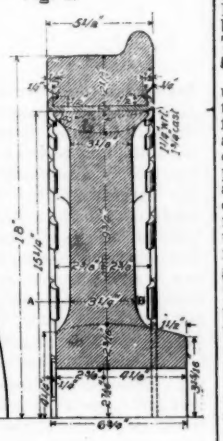


Fig. 3.

CLOUD'S BOLTLESS WHEEL.

The following are the principal features of advantage claimed for this wheel: It is made on principles of construction used all over the world in driving-wheel tires, and also in a great majority of car wheel tires which have been made abroad, where steel-tired wheels are used much more generally than in the United States; that is, the inner face of the tire has a flat bearing upon a flat felloe, and, being without an interior flange, the metal throughout the section of the tire can be properly worked. Interior flanges introduce a bad constructive feature in a wheel subjected to shocks, namely, a sudden change in thickness of the steel, rendering it more likely to break, starting at the root of this inside flange, especially when the tire becomes somewhat worn.

Another advantageous feature of this wheel is the absence of bolts, which should never be used in a wheel, if possible to avoid it, or in any part of railroad rolling stock which is below the springs of the truck, and therefore subjected to all the shocks of running upon the rail without cushioning by springs.

The retaining band, which is inserted between the felloe and the tire, is not joined at its ends, but is allowed to gap open so the ends will not abut; when in place it is, practically, a continuation of the felloe itself. This band grasps the felloe and the tire without necessitating careful mechanical work, and without compelling sharp corners or deep grooves to be made in the tire, hence the tires can be run to a less thickness before being condemned on account of being too thin from the throat of the flange across to such groove or corners. It is probably true that a given tire can be worn thinner when used with this tire fastener than when used with the Mansell or the Gibson fastening.

In addition to these advantages, the boltless wheel is cheaper to make than most other forms of wheels which have a retaining device, and it makes possible the use of a cast iron centre of good form, and the actual service of the cast iron centres in large driving wheels with the engines coupled to them, is all the proof necessary that the cast iron centre is good, safe and durable. Of course, the boltless wheel may be made with wrought iron centres if desired, and the pattern of centre either wrought iron or cast iron may be either spoke or plate as preferred, but the best service per dollar expended will probably be had by the use of a cast iron centre, which can be retired when the tire is worn out, but it requires in doing so a new retaining band, as the old one must be destroyed to remove the tire.

Some three hundred of these wheels with cast iron centres have been in service, some of them as long as four and one-half years, and so far have substantiated the claims made for the design.

Stay Bolts for Locomotives.

At the March meeting of the New England Railroad Club President Richards announced as the subject for discussion: "Screw stay bolts for locomotives. Size of bolts for use at a working pressure of 175 lbs. Distance between bolts. What is the proper way to inspect stay bolts? Best materials for stay bolts. What should be the test of a standard stay bolt, size one inch diameter, elastic limit, and tensile strength?" The subject was opened by Mr. John N. Lauder, of the Old Colony.

Mr. LAUDER: Twenty-five years ago 120 lbs. pressure carried on our locomotive boilers was considered the standard. Few at that time, I presume, supposed that 25 years hence we would be carrying pressures well up to 200 lbs., but such is the fact. . . . It is a race to-day between heavy loads and power to haul them, and the end is not yet.

When it comes to moving freight at a profit for considerably less than a cent a ton per mile, it means that immense loads must be moved by one engine. Of course, I suppose we will all agree that the more tons of load we can haul in one train with one engine, one train through, the lower the cost of moving freight will be. That idea might be combatted by some by saying that beyond a certain point in the working of the locomotive it is not economy to go. That is true in the matter of fuel, and that is about the only item wherein it is true. If our loads could be so regulated as to be hauled by the locomotive at its most economical point of working as regards fuel, it would save in fuel, but it would multiply the number of trains, engines and engine crews that we should have to employ. Therefore, the only solution of this question of hauling freight at low rates is to have powerful engines to haul big trains.

I think we will all agree that our engines are getting to about their limit of weight—to their utmost maximum of weight—and the problem is how to get more power out of the engines without increasing the weight. That can only be done by increasing the steam pressures, thereby increasing their powers. One hundred and sixty, or even 170 lbs., carried on our boilers is nothing unusual, and the tendency is to increase beyond that Experiments are being made in various parts of the country at the present time with the so-called compound locomotive, the use of which will necessitate still higher pressure in our boilers than we are now carrying, probably, to get their full efficiency.

If we could build our locomotive boilers as we do stationary boilers, we could easily get boilers of sufficient strength to safely carry these high pressures; but unfortunately in the locomotive the boiler is such that flat surfaces must be employed, and flat surfaces can only be held in place by some system of tying them together. The universal practice, as we all know, is to tie the plates together with screw stays. Now, screw stays could be put into a boiler that would without doubt carry safely almost any pressure, were it not for the expansion of metals under different temperatures; and I apprehend that it is well understood that the cause of broken stay bolts is mainly the expansion of the metal. In proof of that fact we have this, that stay bolts near the bottom of the furnace rarely break. They are, of course, subjected to the same tensile strains that they are above that point; but at the bottom of the furnace, near the mud-ring, the two plates forming the furnace, the outside and inside plates, with the pressure between them, are tied solidly by the mud-ring, but differences in temperature between the fire-box plate and the outside plate are so little that the two plates get near the top of the furnace, owing to several causes, the inside plates expand more than the outside plates, and consequently there is an elongation of the plates on the inside beyond that of those on the outside, and a continual bending strain on those screw stays. . . .

Stay bolts invariably break close to the outside plate. That is easily explained. It is there where the bending strains are concentrated, and the movement is close to the outside sheet of the furnace, and expand together, and consequently there is no bending action brought upon the stay bolts at that point. As you I think that is where they invariably break. As a matter of safety, almost every locomotive man now perforates the stay bolt from the outside in for the distance of perhaps one inch—far enough to be sure to get beyond the point where the fracture takes place. When the stay bolt breaks, that produces a leak, and gives us warning that that bolt is broken, or partially broken off, and it can be removed. But these little holes drilled into the end of that bolt may become clogged up with dirt grease and other things, and that is not an infallible remedy for the difficulty. I have seen perforated stay bolts that were broken off and produced no leak. . . .

I have here a broken stay bolt which I think illustrates the action I have spoken of in regard to the manner in which these bolts break. The ordinary method of testing a bolt is to hold a sledge on one end of the stay bolt, and tap it with another on the other end, and an expert boiler maker can determine almost absolutely whether that bolt is broken or not—whether it is entirely broken or not—and that is all he can tell. If there is one-quarter of the surface of a stay bolt still unbroken, that test will not tell him that. If it is entirely broken and parted, so that the two surfaces are not in contact, it is an almost infallible test, if the man who makes it is an expert. Now this bolt which I have here was in a boiler by the side of one that was broken. The boiler maker drilled out the stay bolt and found it broken. I told him to drill out the next one, and this is the one, and this is broken about two-thirds off; I don't know as there is over a quarter of it unbroken. That is very suggestive. It shows how little we know or can know of the safety of the stay bolts in our boilers. I don't know how many of the stay bolts in that same boiler are partly broken and liable to let go at any time. This shows that it was this movement up and down that gradually broke the stay bolt.

The next branch of the subject is the size of bolts for use at a working pressure of 175 pounds. Now, I have no theoretical answer to make to this query. . . . But for 175 lbs. pressure ⅞-in. stays will not stand, as I have demonstrated in practice, and consequently you must have them larger. My practice is to put in inch stays, not over 4 ins. apart between centres, and I am running boilers, with stay bolts of that size successfully, carrying 170 lbs. pressure. I have carried for a few months 190 lbs., but the boiler was not adapted to carry that pressure when it was new. Now I find that the best material I have ever been able to get for stay bolts begins to give way after they have been in service under those high pressures for about six years, and I have this suggestion to make: that it may be a proper thing to do to remove systematically stay-bolts that have been used a certain number of years, say from the ordinary position of the frame of the boiler to the top. We here in New England, where our water is pure, are more vitally interested in the question of proper material for stay bolts, and their size and strength, than they are in the West, because here a fire-box will run perhaps twenty years without being removed . . . and I suggest to the men who have the care and responsibility of managing the locomotives on New England roads the advisability of removing the stay bolts after a stated period of years, either all of them, or the portion near the top, at least as far down as the frames, no matter what material they are made of. I don't think that period should be over eight years.

The next problem presented to us in the discussion is the distance between bolts. That does not need any particular attention, because it is simply a question of arithmetic. . . .

The next question is, What is the proper way to inspect stay bolts? I know of but one way, and that is holding a sledge on one end of the stay bolt and rapping it with a hammer on the other end, whereby an expert tester will determine almost absolutely whether the bolt is broken or not; but, as I said before, he cannot determine whether it is partially broken, and he cannot tell but that a great many are two-thirds broken off, they being in a position where they cannot be inspected by examination other than in the way I have mentioned.

As to the best material for stay bolts, I venture to say that there is no man, scientific or practical, expert or otherwise, who would be willing to state just what kind of material will make the best and most durable stay bolts. Most of us will say that we don't care for a metal that is of very high tensile strength; but we want a metal that is very tough and ductile, fibrous, something that will resist the bending strains brought upon it. That would seem to be true, but within a few years I have seen this: A boiler was built of so-called Norway iron, and that iron was tested in a practical way and found so ductile that a bar of it, cold, could be bent over under the hammer and drivon down solid without any breaking whatever. It would seem that that was an ideal metal for stay bolts. That boiler was put into ordinary service, with 140 lbs. pressure, and inside of five years a lot of the stay bolts on one side gave way. When those bolts were taken out some of them were as brittle as any piece of cast iron I ever saw. I put one of them into a vise, and with one blow of an ordinary hammer broke off one of the longer stays at the top, then took the balance and annealed it, doubled it down and hammered it down without a fracture. Several years ago a low grade of steel was used for stay bolts, on the theory that it was so much stronger than iron and was so ductile. I think it proved to be the worst metal that could possibly be used, breaking sooner than ordinary grades of iron, and so we had to fall back on iron, and the problem is to get iron that will stand for the longest period under the strains to which stay bolts are subjected.

Mr. J. T. GORDON: In contracting for a couple of locomotives to carry 175 lbs. pressure, I put in a specification for the bolts to be one inch in diameter, and the five top rows to be an inch and one-eighth, and I would like to ask Mr. Lauder if he puts the same size of bolt in the top row that he does below.

Mr. LAUDER: I put in the same size allthrough, but reenforce the top by an extra row between the top row proper and the second row. . . . About a year ago I was requested by the Railroad Commissioners of Massachusetts to test our stay bolts every quarter and make a report to them. I opposed it as an unnecessary hardship, as it is a very difficult thing to do for a road having several hundred engines in service, but said if they insisted upon it I would do it. We complied with the request, and I have since seen the benefit of it, and wouldn't abandon it to-day under any condition, and if the managers of the Old Colony Railroad should give me an order to-day to discontinue this practice and go back to the old method I wouldn't obey it; I would sooner resign my position. Anything that we can do to ascertain the condition of our boilers and keep them in safe running order we are bound to do.

Mr. COUGHLIN: Marine engineers always inspect their boilers under hydraulic pressure, and they discover more broken rivets and stay bolts at that time than any other. When the boiler is under pressure it strains apart the sheets and an opportunity is given to find out the weak spots. I have known inspectors to find 10 stay bolts broken which were pronounced perfectly safe before the pressure was applied. I think the same rule should be applied to locomotive boilers, because the pressure will separate the sheets, though not to any great extent, and by tapping the stay bolts on the head at that time you get a better indication by the sound as to whether they are broken or not.

Mr. LAUDER: That plan has been tried and abandoned because the inspectors could not tell whether the bolt was broken if under water. I think it would be bet to let in compressed air and then test the boiler.

Beasley's Seal Lock.

The drawings shown herewith illustrate a seal adapted for freight car fastenings and similar purposes, recently patented by Mr. W. F. Beasley, of Baltimore, Md. The special feature of this seal is the numbering device, which makes it easy to keep an exact account, in connection with the ordinary seal record, of the number of times a car has been opened. Every time the locking bolt is pushed upward to admit of the removal of the hasp, the numbering wheel, shown in fig. 3, the figures of which appear through the aperture at *h*, fig. 2, is moved one notch. For instance, the number now appearing in the cut is 5502. After another unlocking the number will be 5503. The construction of the number wheels is similar to that of the similar apparatus used to count the revolutions of wheels in stationary engines, etc.

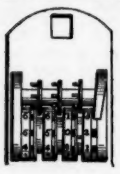


Fig. 3.

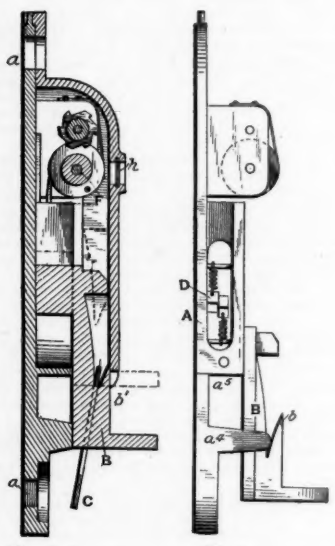


Fig. 2. Fig 1.

Beasley's Seal Lock.

Fig. 1 shows a side view with the casing off and fig. 2 a section through the middle. The seal consists of a circular disc of tin with a hole punched out of it, permitting it to be hung in the slot indicated at *b*, before the door is closed. The tin itself is indicated by *C*. The lock is fastened to the car at *a a*.

In operating this lock the bolt *B* is first pushed upward as far as possible, to admit the insertion of the hasp in the space a^5. The hasp is inserted and *B* is pulled down as far as possible, and the tin is then inserted as shown in fig. 2. *B* is then pushed upward and the dogs at *D* lock it so that it cannot be pulled back, while the tin prevents it from being pushed further up, so the hasp is held and the door is locked. On breaking the tin and pushing the bolt *B* up far enough to remove the hasp, wheel *F* is revolved and the number changes.

This lock costs about $2.50, or $5 per car, and is used with satisfaction by the Pennsylvania road. A lock made on the same principle is used by the Post-Office Department in sealing registered letter packages.

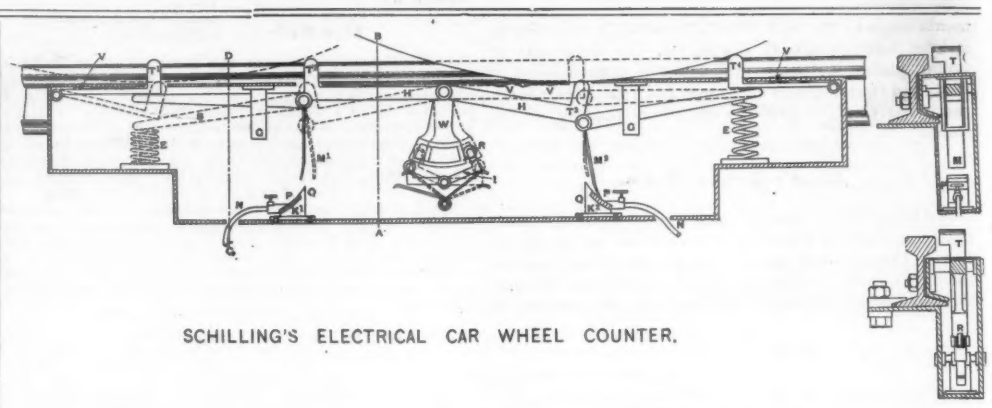
Schilling's Wheel Counter.

We have received from Mr. W. Schilling, Royal Government Engineer, Germany, the following description of an apparatus for recording the number of wheels passing a given point.

Mr. Schilling prefaces the description of the apparatus by a general statement of the problem and conditions. He says that statistics show that in Germany the greater number of accidents which happen in railroad operation occur at stations. With the growth of stations, the increasing speed and length of trains, the increasing number of trains and the diminished headway, the liabilities to accidents are becoming greater from year to year. Necessarily, the management of a station yard must be confided to one officer, but it is usually impossible for him to tell whether or not a train 600 metres long has entirely passed a given switch. The consequence is frequent delays and occasional accidents. It is with a view to record in some convenient place, for the information of the station chief, the position of any train that Mr. Schilling devised the apparatus which is described here

In the matter of safety of trains entering stations there are three important questions to be considered, viz.: whether the entering train (1) has entirely passed the in-bound switch and has, therefore, moved beyond the distance post; (2) has reached the out-bound switch at the other end of the station; (3) has the full complement of axles with which it left the last station, or whether it has parted on the way.

If at each of the marking posts of the in- and outgoing switches at a station a wheel indicator be placed which, for each wheel flange passing over it, would close an electric circuit, the circuits being different for arriving and departing trains, then, by means of dials and pointers operated by electro-magnets, satisfactory



SCHILLING'S ELECTRICAL CAR WHEEL COUNTER.

answers to the above questions could be obtained. The dials could be mounted on suitable standards on the station platform within easy view of the station agent. Each dial may have two pointers, a black one and a red one, and be graduated from 0 to 170, corresponding to the largest number of axles (including engine and tender). The black pointer, or index, is actuated by the indicator at the in-coming switch. Each wheel of an entering train passing over the indicator causes the index to advance over one space, and each wheel passing over it in the opposite direction causes the pointer to fall back one division. The red pointer serves a similar purpose for the out-going switch.

If the station agent be advised by telegraph from the next station on the line of the number of axles in the train which is to arrive, it is simply necessary for him to watch the black pointer on the dial corresponding to the in-coming switch. The pointer is supposed to be at zero. If on the arrival of the train the pointer advances to the figure corresponding to the number of axles announced, then questions 1 and 3 have been answered in the affirmative. Question 2is answered by the red pointer.

The difficulties of turning out a mechanical device of the above character are not to be underrated. The main feature of the whole arrangement lies in the wheel indicator. The latter must be such as to properly operate the electric circuits, even when one of the wheels comes to rest directly over it, and then moves back in the direction from which it came.

Schilling's indicator, shown in the accompanying engravings, is designed to meet these requirements: (a) It closes different electric circuits according to the direction in which a wheel passes over it. (b) Each individual wheel passing over it causes a separate circuit closure; accordingly, it may be made to serve the purpose of a counter for the axles, by registering the several circuit openings and closures in some convenient manner. (c) Finally, if a wheel coming, say, from the right, passes to a point directly above the indicator, stops there, and then rolls off again to the right, the device will correctly register both movements.

These various ends are accomplished as follows: (a) The contact points are located to the right and left of the insulating blocks *k*. At the sides of these are conducting strips *p*, connected with wires *n*. The sides *q* are insulated, or rather made of some non-conductor. If the steel spring *m* touches the strip *p* the circuit will be closed. In the case of a wheel coming from the left, the wheel flange first presses down the projecting point *t*; this moves the spring *m* to the right and, on the descent of the point t_2, causes its contact with the non-conducting surface *q*. The advancing wheel next presses down the point t_3 (t_2 and t_3 being rigidly connected by the pivoted lever *h*); this brings the spring m_2 in contact with the strip *p*, closing the circuit. As the wheel advances still further it strikes the point t_4 and depresses it, thus insuring perfect contact between m_2 and *p*. If a wheel pass from right to left the operation is simply reversed, the circuit being closed by the contact between the spring m_1 and strip *p*.

(b) If a wheel passes from left to right, the projecting point t_2, after having been depressed, again rises to the position shown in full lines, and is thus ready to again be acted on by the next wheel. It will, therefore, be understood that every wheel going from the left to right will cause a closing of the electric circuit at k_2. For a wheel going from right to left the operation is, of course, reversed.

(c) If a wheel comes from the left to a point over the indicator and stops there, it is clear that the circuit can be closed only after it has passed beyond the middle point and has reached the point t_3. If the wheel flange presses down the point t_3 only slightly, which might possibly cause a closing of the circuit at k_2, then the turning of the weight *W*, which is firmly attached to the lever *h*, helps to force t_3 down fully, so as to certainly close the circuit. Rollers *r*, mounted in levers *i*, are kept in contact with *W* by springs as shown. The closing of the circuit at k_2, of course, entails the ascent of the point t_2, and this, in turn, insures closing of the curcuit at k_1, when the car wheel goes back.

The springs *e* are made stiff enough to cause a quick return of the levers *s*, and contact points t_1 and t_4, after having been pressed down by passing wheels. The shock which might be caused by this is taken up by flat springs at *v*. The paths of the levers *s* are controlled by the guides *g g*.

Early German Studies of American Railroads.

III.—THE UTICA & SCHENECTADY RAILROAD.

The model railroad of New York at that time (1839), and the one whose success led to the establishment of many other lines, was the Utica & Schenectady, 77¾ miles long, much longer than any other railroad in the state. There had been a great stage coach traffic on this route before the railroad was built. The fare by coaches had been $3.50 in summer and $8 (so Gerstner's book says) in winter; so the road did not have to wait until it had developed a traffic, as was, and is, the case with so many other lines. It was chartered to carry passengers only, and seems substantially to have been nothing but a substitute for the old stage coach line.

The construction of this railroad was begun in 1834, and it was opened through Aug. 2, 1836. There were some heavy rock cuttings near Little Falls, and to reduce them the road was built there at first with a reversed curve of 400 ft. radius: but later this was changed so that a simple curve of 700 ft. radius took its place. Instead of having a double track throughout, like its eastern connection, the Mohawk & Hudson, a section 10 miles long, afterward extended to 20 miles, in the middle of its length was provided, in order that the trains might pass in opposite directions without delay, and this was found amply sufficient and is greatly recommended, as if it were a discovery of importance. It seems that then it was generally supposed that trains would always start at each terminus in the morning (or night trains in the evening) at the same time, so that they would naturally meet about the middle of the length of the road, and, therefore, a section of double track of moderate length there would be substantially as good as a double track throughout.

The superstructure of the Utica & Schenectady was, in essentials, the kind prevailing in the United States at this time. It was essentially a timber structure—a piece of rough carpenter work—which explains the prominent place taken by carpenters on the pay-rolls of the time; a roadmaster was rather a carpenter than anything else.

The Utica & Schenectady superstructure began with two longitudinal sleepers, 9 in. × 4 in., under the lines of rails, held in position apparently only by the roadbed material. The cross ties which rested on these sleepers were spaced apparently 3 ft. from centre to centre; they were 8 ft. long × 6 in. high × 5 in. wide, mortised down

half their height to receive the longitudinal rail timbers, and hollowed down for about 3½ ft. between the rails to contain road material for a horse path, so that they were only about 3 in. thick in the middle. The mortise was about an inch wider than the longitudinal rail timber, and in this space, inside of that timber, a wooden wedge was driven.

The equipment of the railroad in 1839 consisted of 12 locomotives built by M. W. Baldwin, 65 four-wheel passenger cars, a number of baggage and wood cars (one of which latter was always attached next the tender to carry an additional stock of fuel), and five snow plows. The locomotives were originally all six-wheeled—a pair of drivers and a four-wheeled truck. They had 12 in. 16 in. cylinders, 4 ft. 6 in. driving wheels, and weighed empty 19,000 lbs. One of them, however, had been rebuilt with four 5-ft. drivers, the truck remaining. The first-class passenger cars all had three compartments each, with seats for eight in each compartment. The wood car carried two cords of wood, and at wooding stations one always stood ready loaded to be taken on the train in place of the empty one. The passenger cars were heated in winter by means of stoves fed from the outside; pipes carried hot air from this stove throughout the car. Such a car weighed 4,700 lbs., and, built in the company's own shops, cost $1,000. The snow plows cost $500 each.

There were usually three trains each way daily over this railroad from some time in April until the first of November (but in 1839 only two); during the month of November and the first part of April there were two, and for the other four months of the year only one train daily. The day trains took five hours and the night

trains seven hours for the run of 78 miles, the stops on the way taking about an hour. As an extraordinary performance is mentioned the carrying of the Governor's message in January, 1838, through from Schenectady to Utica in 2 hours and 57 minutes, making two stops for water and ten for changing mail bags, leaving the running time 2 hours and 34 minutes—30.3 miles per hour—but this train hauled no cars.

In summer there were usually 12 passenger cars, 4 baggage cars, 1 mail car and 1 wood car in each day train; 6 passenger, 2 baggage, 1 mail and 1 wood car in each night train. In winter there were but five or six passenger cars in a train. The average for the whole year and for all trains was 9 passenger, 3 baggage, ¾ mail and 1 wood car. The train crew was formed by a conductor, a baggage man and one brakeman. The latter had a seat on the wood car, with his back to the engine, where he overlooked all the other cars of the train. The through fare was $3 (3.85 cents per mile) and the local fares 4 cents per mile, which was the maximum permitted by the charter. The average train-load was 78 passengers, which, be it remembered, is about one-third greater than the average passenger train-load in the United States to-day; and the average earnings per train mile were $3.19, which sufficiently explains the profitableness of the road, to which contributed its low cost of $22,905 per mile, and the fact that down to that time renewals of the timbers of the superstructure had not been necessary. Until the year 1839 the company carried second class passengers, in very bad cars, for half the first-class fare, or $1.50 for the through trip but, though open to everybody, none but immigrants rode in them.

The locomotives had run an average distance of 13,358 miles per year; the passenger cars, 16,386 miles; the average weight of the cars in strain was 34.8 tons, and the average expense per train mile, $1.06—a common average expense in these days for trains many times as heavy. The net earnings had averaged $3,086 per mile of road (nearly 50 per cent. more than the average of American railroads to-day), which was 13½ per cent. on the capital expended. This railroad had been constructed under the direction of Mr. W. C. Young, who remained as its Superintendent after it was completed, and received the then almost-unheard-of salary of $5,000 per year. There was a Superintendent of Locomotives at a salary of $1,200 a year, four superintendents of road repairs for as many divisions at $60 a month, and a "Collector" at each terminus at $1,000 a year, the pay of these latter coming partly from the connecting railroads. There were four conductors at $60 and two at $50 a month. They made two through trips by day or one by night for a day's work, and were required also to assist the collectors at Utica and Schenectady. The four baggagemen received $30 a month each, the four brakemen, $25. The enginemen made one through trip daily and cleaned their engines for $2.50 per day; when employed in the shops they received $1.75 per day. The foremen of the machine shop, the blacksmith shop and the cabinet shop received $2 per day each. Shop workmen were paid $1 to $1.75 per day; apprentices, 24 cents a day the first year, 58 cents the second and 62½ cents the third. Ten hours was a day's work. In summer a gang of four men was employed in keeping up 4½ miles of road; in winter the same force maintained six miles. The laborers' wages were 87½ cents per day. The whole force on the road consisted of about 200 men, one half of whom were employed on the track, 40 in the shops and as enginemen and firemen, and 60 chiefly in the transportation service. Aside from the two "collectors," the station force seems to have consisted of three laborers in the car sheds at each terminus, at $25 and $30 a month, who cleaned and shifted the cars, assisted in loading and unloading baggage and kept the station in order, and one laborer at each way station where passengers were received at $25 a month. The directors received no pay, but the Secretary and Treasurer (Mr. G. Hanley) had a salary of $1,000 a year. There is no mention made of any other clerical book-keeping or auditing force, and Mr. Hanley must have been a prettybusy man.

Bridge Floors made of Old Rails.

In our issue of Oct. 3, 1890, we gave a description of the manner in which old steel rails are used for bridge floors on the New York Central & Hudson River. We are now able to give details of the use of scrap-iron rails on Indian roads for a similar purpose.

In the early days of railroad construction in India brick arch bridges were built over most of the small waterways, or where flood openings were considered necessary; but, owing to insufficient foundations, treacherous soil and the difficulty of obtaining good workmen, a large proportion of these structures soon showed signs of failing. In some cases the whole bridge had to be rebuilt, but in others the abutments and piers remained sound while the arches cracked, generally in the centre only, but occasionally at the haunches as well. For a time these bridges were temporarily repaired, or rather patched up, by driving in iron wedges which had been dipped in hot coal tar; but it soon became evident that the defective arches must either be relieved in some way, or rebuilt altogether. The following plan was tried, and has proved satisfactory.

On single-track railroads the line was diverted on both approaches to the bridge, after which the ballast, earth, etc., was cleared out until the brickwork was bare. A brick wall from 21 to 24 in. thick was then built immediately over the abutment or pier, of sufficient height to keep the rail floor at least 3 in. clear of the extrados of the arch. The rail floor was then laid, as shown in fig. 1.

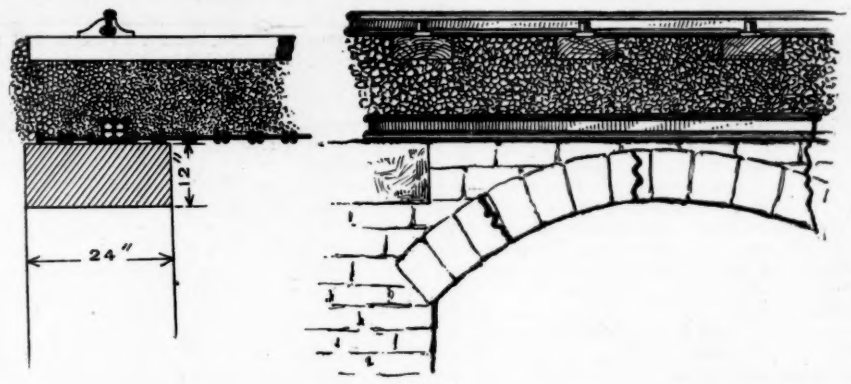


Fig. 1.

INDIAN BRIDGE FLOORS OF OLD RAILS.

For bridges or culverts under 4 ft. span rails laid *flat* were found sufficient. Bridges from 4 to 6 ft. had two rails riveted together, and standing on edge, under each running rail, the intermediate spaces being filled up with rails laid flat. Where the span was over 6 ft. three rails, riveted together, were used on each side, and four rails for spans of 8 to 10 ft.; this last being the greatest span which it was considered desirable to treat in this manner.

The space between the beams or girders was in each case filled with rails laid flat, and this was also done on the outside, until a total width of 14 ft., on 5 ft. 6 in. gauge roads, was covered. In some cases the rails were kept in position, sideways, by brickwork; but a wrought-iron tie-rod was found more satisfactory.

On double-track roads one line was done at a time, the traffic being diverted for a few days to the other track. Where the distance between the parapet walls is not too

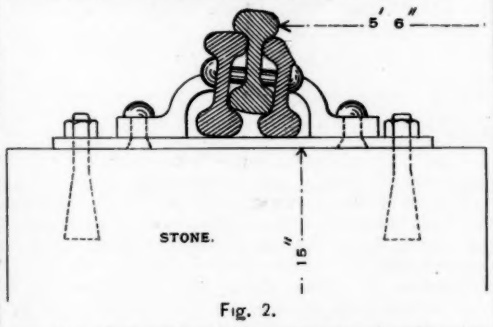


Fig. 2.

great the whole surface is generally covered with rails; but in order to economize, a sheet of iron, with angle-iron stiffeners, has in some cases been riveted to the floor rails, close to the end of the ties, and this keeps the ballast in position very effectually.

As a rule, bridges over 6 ft. span have a bedstone 24 in. long, 18 in. wide, and 12 in. deep under each end of the rail beam; but this is not strictly necessary, and may safely be omitted where stone is expensive. On top of the rail floor, ballast is placed, and the cross ties are then laid and spaced in the same manner as on the embankment on either side of the bridge. There should be at least 9 in. of good stone ballast between the bottom of the cross ties and the top of the rail floor. Space should also be allowed for the water to escape at each end of the dwarf walls on which the rail floor rests.

Cracked arches treated in this manner never get any worse, and, judging by the appearance of some that were relieved 15 years ago, the rail floor ought to last a century at least without requiring any repairs. The rails used are double-headed, and weigh from 72 to 82 lbs. per yard. Only scrap rails are used. The heaviest weight which passes over these bridges is about eight tons on each driver, but a much heavier load could pass with safety at any desired speed.

The same method has been followed with open, girder bridges up to 10 ft. span, in cases where it has been considered necessary to cover the under road in some way, or to avoid the constant repairs which are necessary on each approach to a girder bridge. As these bridges were originally laid with wooden bed plates, it was thought advisable to substitute bedstones before putting in a rail floor. Buckle plates are also used in some cases between the original girders, but this necessitates the girders being lowered, or the track must be raised. Where sufficient headway for carts, elephants, etc., cannot be obtained without raising the track considerably, the girder shown in fig. 2 is used on spans up to 10 ft. Two short pieces of new rail, 4 ft. longer than the span of the bridge, are riveted to the running rail, thus making a girder only 7 in. deep, and dispensing with wooden ties altogether. For this type of girder bedstones not less than 15 in. deep are necessary, as the three-rail girder fits into specially made cast or wrought iron chairs on either side, and these chairs are secured to the bedstones by lewis bolts, thus preserving the gauge. Where the span is greater than 6 ft., an intermediate tie, or stay, is made of a piece of scrap rail; a wrought iron clamp being riveted on either side of the girder rail to prevent it buckling. The rivets which hold the three rails together are of 1 in. diameter, and are spaced 1 ft. apart. It will be seen from the sketch that the upper flange of the inside rail is cut away so as not to interfere with the wheel flanges, and this should always be done.

The centre, or running rail, is of course connected to the adjoining rails on either side in the usual manner, and the spacing of the ties outside of the bridge is the same as in ordinary track work. When the running rail is worn out the rivets can be cut out and a new rail inserted; but the best plan is to make an entirely new girder, and use the side rails from the old girder in some other place.

Deck bridges are coming into general use on the principal Indian railroads, and in some cases cast iron ties are used on top of bridges which have ordinary plates between the girders without any signs of excessive rigidity being observed. For such work, wrought iron decks will probably give better results than steel, so far as India is concerned, as the latter metal oxidizes very rapidly in some parts of the country. Unless some effectual method of preventing deterioration can be used, buckle plate floors will give trouble in the future, and possibly cause accidents as they are in some cases covered with nearly 2 ft. of ballast, and consequently only the under side of the plate can be inspected. This does not apply to old iron rails, which do not rust so rapidly, and besides the factor of safety in such cases is very much greater than in ordinary structures. The sketches are not to scale, but will be easily understood by any one acquainted with railroad work. The three-rail girders shown in fig. 2 can either be decked by having a sheet of iron riveted to the rails or can be left open. No ballast is used in either case.

English Accidents.

The third quarterly report of the British Board of Trade for 1890 describes 12 train accidents which were specially investigated by the board's inspectors. We summarize the facts and conclusions concerning the more noticeable of these.

At Westland Row, on the Dublin, Wicklow & Wexford, July 10, at 10 p. m., a passenger train ran into an empty engine which had been standing on a siding, but which was carelessly moved toward the main track just as the passenger train approached. The engineer was temporarily absent, owing to a call of nature, and a green fireman, who moved the engine a short distance in order to facilitate oiling, became confused when he saw the passenger train coming, and says he was unable to shut off steam. The principal criticisms of the inspector are, that the fireman had been on duty 16¼ hours, and that the engineer did not return to the engine as soon as he might have done, but went out of his way to get a drink of water. This engineer and fireman were booked to work three hours longer, or 19½ hours altogether. On alternate days these men have light work in the engine house, and it is stated that they prefer alternate days of light and heavy work; but General Hutchinson justly says that their wishes in this respect should not be regarded. The men on the passenger train had also been on duty about the same time, and it is quite possible that they were not keeping so vigilant a lookout as fresher men would have done. There is also criticism of the interlocking and of the practice of allowing the empty engine to stand where it did when it might as well have been in a better protected place.

At Fenchurch street, on the Great Eastern, Aug. 20, two cars of a passenger train were derailed at a facing-point switch on a curve. One of the switch rails seems to have been slightly loose and its tip end to have been lifted by the pressure of a wheel on the heel, and the derailment thus caused. The speed of the train was, however, too high for the locality (it was at a junction), and the principal criticisms of General Hutchinson are: 1. The gauge of such a sharp curve ought to be eased. 2. The plunger bolt of the facing-point lock should be between the rails, instead of outside, as it is. 3. The tips of the tongues of the switch rails should be longer, so

that they may extend well under the top flange of the rail.

A slight collision at Limerick Junction, on the Great Southern & Western of Ireland, July 19, is described as resulting from a very lax system of working and very imperfect station arrangements. The stationmaster has habitually allowed engines to move about the yard without signals of any kind from the signalman. Switching in an important passenger yard was carried on under the direction of a young man only 20 years old, and with only 15 months' railroad experience. Certain platform lines in this yard were in a "dangerous and improper state," and had been altered without the sanction of the Board of Trade, as the law requires.

At Clara, on the Athlone branch of the same road, Sept. 19, there was a slight butting collision between a passenger train and a switching engine, the engineer of the former coming into the yard too fast and running by two home signals. This collision would not have occurred had the rule been observed prohibiting switching within 10 minutes of a passenger train's time. The men in charge were blamed for this, but they seem to have used the main track even after trains were due. Also, the collision would have been prevented had the block system been "in force and properly worked," as in such case the passenger train would not have been allowed to leave the preceding station while switching was going on at Clara. Here again the trainmen were found to be overworked, their hours ranging from 13½ to 14¾ a day.

At Cardiff, on the Great Western, Aug. 26, there was a collision in the yard between a passenger train and an empty passenger train which was just being pushed away from the platform. The immediate cause of the collision was a misplaced switch, but the principal trouble was that a signalman gave a hand signal for one of the engineers to pass a home signal which stood at danger, his excuse for doing so being that the home signal was electrically locked from the next cabin, and if he waited for it some delay would be incurred. If, however, signals had been given by semaphores instead of by hand the wrong position of the switch would have been discovered in season. The locking of this home signal from another cabin was established to avoid the erection of an additional distant signal. This defect the company proposes to remedy, but, as Colonel Rich truly says, no interlocking can prevent accidents of this kind if engineers are hand-signaled past fixed stop signals.

At Liverpool Exchange, on the Lancashire & Yorkshire, July 22, a train ran into the terminal station too fast and struck two empty carriages standing there and pushed them against the hydraulic buffers at the end of the track. An error of judgment on the part of the engineer, who was a man of 33 years' experience, was the cause of the trouble. But the inspector takes occasion to again air the rule about not allowing the continuous brakes to be used on entering terminals at junction stations. Readers will remember that the absolute enforcement of this rule is recommended on all possible occasions by the British inspectors. In this case, however, General Hutchinson observes that "there may be stations on this road where it would be highly inconvenient to strictly observe the rule," and he admits that possibly it would be proper to relax it in such cases. The hydraulic buffers materially mitigated the severity of the collision.

Near Eastleigh, on the London & Southwestern, July 12, a light engine, returning home after taking out an excursion train, ran into the tail of a freight train about 9 p. m., the freight train having been held 34 minutes at the outgoing end of a block section about two miles long. The freight was considerably smashed, and a piece of the caboose was thrown over so as to pierce the brake van of a passenger train passing on the adjoining track, killing the conductor riding therein. The engineer of the empty engine claims to have been looking across the curve for the home signal, and thus to have been led into the blunder of not looking for the tail lights of the freight, which were plainly visible. But both he and his fireman had been on duty 16½ hours, and the engineer had been suffering from neuralgia for some days, so that the inspector, Major Marindin, concludes that both of them were asleep, or nearly so. They had run past two danger signals at the preceding block station at 30 or 40 miles an hour, in spite of strenuous efforts on the part of the signalman to attract their attention. This case afforded a striking illustration of the dangers of overwork, a subject which is now being considerably agitated in England. It appeared that the engineer, after a day's work of 12¼ hours, made no objection to running extra with a special train. The locomotive foreman who ordered the engineer to make the extra run is not blamed, "for he was only acting in accordance with a recognized practice for which, however vicious it may be, he is not responsible." This special train was run because certain regular trains were late or extra heavy, and it appears that, in order to provide a sufficient contingent force at this point, it would be necessary to increase the number of spare engines there. We have here a definite instance of the way the financial question at once comes up if the abatement of long working hours is considered. This engineer when running home empty, after his long day, was stopped at Salisbury to do some switching. This was improper, says the inspector, but it is admitted that he would not have got home any sooner if he had not done the work.

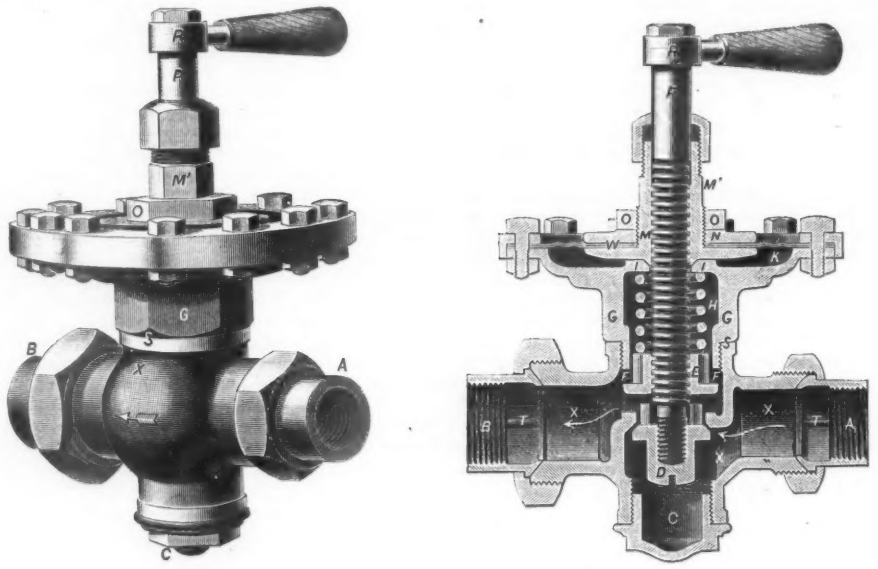
The rear guard of the freight sat in his caboose during the 34 minutes' detention, but not a word is said in the report about the fact that he could have prevented the collision by going back with torpedoes; and English roads' rules require this the same as do ours.

A locomotive boiler explosion at Maesycrugiau, on the Manchester & Milford, investigated by Colonel Rich, was found to have resulted from the corrosion of plates where the water had lodged at the top of the lap joints. The boiler was built in 1866, and the rust had eaten in some places half way through the plates. This weakness could not be detected, and was the result of a mode of boiler construction that has now been abandoned. Most of the inspectors' accident reports are quite verbose, but the conclusion of this one is a model, being embraced in a single line: "The engine blew up in consequence of the boiler being worn out."

At Milngavie Junction, on the North British Railway, Aug. 27, 30 passengers were injured in a butting collision between a passenger train and a freight train, which was standing on the main line, near the branch on which the passenger train was approaching. The engineer of the latter was not very well acquainted with the line and mistook a signal, which, it is admitted, was so placed as to deceive him, two home signals being in such relative positions as to mislead a runner used to signals properly arranged. "Great allowance must be made for this mistake," therefore. The freight engine was, however, visible for some distance, and the passenger train runner was not so cautious as he might have been. The freight runner, when he saw the passenger train approaching uncontrolled, jumped off and ran in another direction to stop an express train, for which he saw the signals were lowered. The signalman had, however succeeded in stopping the express, and he is praised for his promtness in so doing, as is also the engineer of the express for keeping a sharp lookout. The freight engineer is justified in acting as he did, though if he had stayed on his engine and set back he might possibly have prevented the collision. The signalman at the junction is also commended for having thrown a crossover switch so that the collision should be butting instead of sidewise. The use of the block system would have prevented this collision the same as that at Clara, and the lack of a continuous brake on a passenger train is also condemned, as a good power brake would probably have greatly diminished its violence at least. A freight engine was hauling the passenger train, owing to derangement of traffic ensuing upon the collapse of a tunnel ten days before.

At Stony Street Junction, on the Southeastern, Sept. 27, a passenger train which had just left the station was run into by another one starting three minutes later, the runner of which started out too fast and did not keep a sharp lookout. It appears that hand signals are employed here to a limited extent, and that General Hutchinson does not condemn the practice in unqualified terms; but his ground for leniency seems to be "the present gorged state of Cannon Street Station," from which Stony Street is not far distant.

At Selby, on the Northeastern, Aug. 9, an exciting collision occurred in consequence of a freight engineer running 40 miles an hour and coming into the yard at very excessive speed. The circumstances were these: At about 4:30 a. m. a passenger train, standing at the platform, on a loop line, was so long that both its front and rear ends fouled the main line, which it had just left. The freight came on at uncontrollable speed, smashed through the brake van at the rear of the passenger train, then ran alongside the train for its whole length, and tore the passenger engine away from its tender, and pushed it along several rods. The freight engineer Heslop, had not been overworked, but was suffering from mental trouble, having left his wife dangerously ill at York. His fireman was not well acquainted with the line. Heslop told a story about the stiffness of his throttle-valve and difficulty in shutting off steam, but General Hutchinson does not believe it. Heslop had run this engine 35 times, had put oil in the boiler to lubricate the regulator, but had stopped doing so some time before; so it is concluded that he had not had such serious trouble with it as he claims. He claims to have whistled and reversed at some point, but the evidence of other witnesses does not sustain him. The signalman in the east cabin waved a flag (it was daylight), but was unable to attract the attention of Heslop. The engineer of a passenger train going in the opposite direction saw what was up and blew his whistle. This warned the signalman at the station tower, near the rear of the standing passenger train, and he, just in the nick of time, turned the switch so as to let the freight run by on the main track instead of striking the passenger squarely. The engineer of the standing passenger train quickly applied his power brake, set his reverse lever in mid-gear and jumped off. By this he no doubt saved the passenger train from being dragged into the wreck. Heslop's error was the mor



FOSTER PRESSURE REGULATOR.

Made by the FOSTER ENGINEERING COMPANY, *New York.*

dangerous, as, "in consequence of the ricketty condition of a bridge at this station," the speed was restricted by rule, to four miles an hour. The signalman in the east cabin is mildly censured for not sooner calling the attention of the signalman at the station cabin, instead of giving his whole time to waving the red flag.

Pressure Regulators for Steam Heating.

In writing last week of the theories of Mr. Clark and Mr. Depew as to the danger of steam heating, we spoke of the importance of a reducing valve which should shut off steam in case of a failure in operation due to a broken spring. Such a valve is found in the Foster "pressure regulator," the action of which is as follows: Steam enters at *A*, and, passing through the valve, is delivered at *B*. As will be seen, the delivery pressure entering chamber *K* tends to raise the diaphragm and to close the valve. In opposition to this the compressed spring *H* tends to open the valve. When the valve is in operation there is an equilibrium between these two forces. If the delivery pressure falls, the pressure on the diaphragm is diminished and the spring, overcoming the lighter resistance, opens the valve until the equilibrium is again established and the pressure restored; on the other hand, any increased delivery pressure bearing on the diaphragm overcomes the resistance of the spring and draws the valve toward its seat in proportion to the increased pressure. When the tension of the spring is proportioned to the pressure bearing on the diaphragm, a constant and uniform discharge is insured.

The spring nut *E* is threaded onto the spindle, and, having wings which extend into the hexagon spring chamber *H*, it is prevented from turning with the spindle, but is free to move up and down with it. The flange on the lower side of the spring nut *E* is a stop to prevent an excessive lift and rupture of the diaphragm. The opening of the valve *D* is regulated by turning the spindle which is threaded into *M*.

It will be seen from this that if the spring should break the equilibrium would be destroyed and the delivery pressure bearing on the diaphragm would close the valve and stop the flow of steam to the train pipe. In this case it is not only a regulating valve, but in the event of the spring breaking it becomes an automatic check valve.

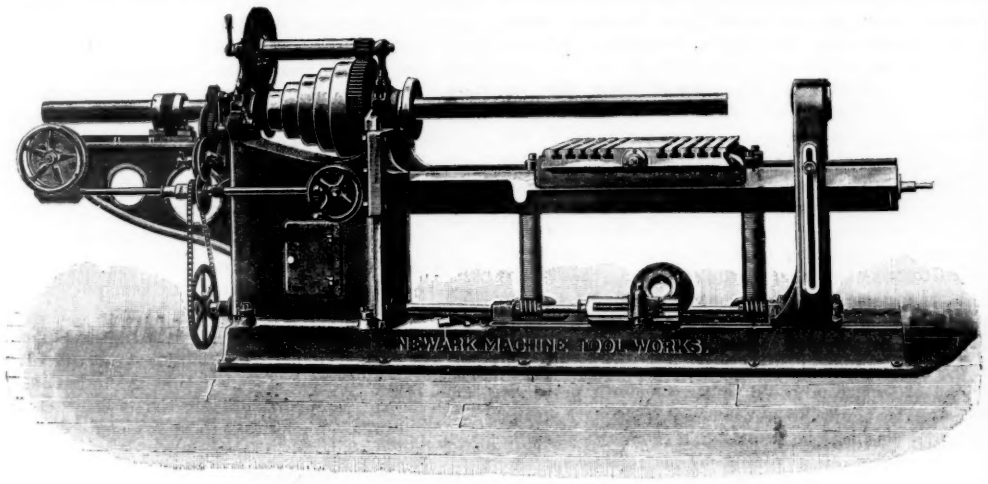
This valve, being an automatic regulator, can control to a nicety the steam admitted to each car, making it possible to carry in the train pipe enough pressure to get a quick and adequate circulation the whole length of the train, and at the same time to carry a low pressure in each car. This is the ideal condition, and one of the

most common troubles in steam-heated trains is to keep the front cars cool enough if the rear cars are warm enough.

It will be noticed that the Foster valve is free from the element of friction and the consequent liability to sticking.

Horizontal Boring and Drilling Machine.

The cut shows one of the larger sizes of horizontal boring machines which are built by the Newark Machine Tool Works, Newark, N. J. A few months since we illustrated their C, or 3-in. bar, machine. The makers call this the E, or 5-in. bar, machine. It has been the custom heretofore to grade the class of machine tools by the swing; but the Newark Machine Tool Works claim that the diameter of the boring bar is the only correct measure of the size of the tool, for this limits, rather than the swing, its greatest cylinder boring capacity.



HORIZONTAL BORING AND DRILLING MACHINE.

The cut shows a table 9 ft. in length; but shorter tables are furnished, and the swing may be increased if desired. This machine has the same features shown in the illustration of the smaller tool. The feed can be varied from 1 to ¼ without stopping the machine; the bar can be gripped at any point, and it can be fed backwards or forwards without resetting the cutters. There is also a quick and slow hand motion for the bar.

The power lift for the table is a feature peculiar to the larger machines. It will be noticed that the lower ends of the table lifting screws are carried by worm gears threaded to serve as nuts. These gears take their motion from the worm shaft, which is driven from the feed shaft by means of the chain gearing. In this way the power from the driving cone is used to lift the table, and this arrangement enables the workman to move the table without leaving his position, and when the work is nearly set he can throw the power lift out of gear and make the delicate final adjustment by hand, using the slow-feed hand wheel.

Other points of excellence are the strong forms of table and yoke. The table is not cut in two to receive the feed screw for the saddle, and this construction permits a system of cross-bracing underneath. These features add materially to the stiffness of the machine.

The following are some of the principal dimensions: Swing over carriage, 5 ft. 2 in.; swing over table, 6 ft.; diameter of large cone speed, 21 in.; width of step, 4 in.; carriage, 42 in. square; length of machine, 16 ft.; weight, 17,000 lbs. The machine is designed to bore cylinders up to 30 in. in diam.

Discriminations from the Use of Private Cars.*

One of the features of transportation at the present day demanding serious consideration is the extensive use of private cars owned by shippers. If the use of such cars concerned only carriers themselves it would be a private matter, to be dealt with between the managers of corporations and the investors in the property, but the discriminations among shippers to which the practice leads make it a public matter of pronounced importance.

The use by carriers of private cars of shippers instead of their own equipment has developed in the last few years to very large proportions. Many thousands of them are now in use for the transportation of various kinds of traffic. The principal articles for which they are used are petroleum and cotton-seed oils, turpentine, livestock and dressed meats. These cars are mostly of improved style, such as tank cars, for oil and turpentine, livestock cars adapted for feeding and watering stock on the train, and refrigerator cars arranged for the preservation of fresh meats; and they usually cost somewhat more than the cars owned and furnished by carriers themselves. In some instances, however, ordinary box cars similar to those furnished by carriers are supplied by shippers.

The right of a railroad company to haul private cars of shippers, if it see fit to do so, is not now called in question; but a road is under no obligation to do so. It does so in the exercise of its own volition. Railroad companies are chartered for much more than the mere construction of their roadways. They are required and expected to equip and operate their roads, and their equipment must be suitable and sufficient for the business in which they engage. These are primary public duties, required as conditions of the franchise, and admit of no excuse for non-compliance. The relations and office of a common carrier are inconsistent with any meddling on the part of others with its property or its mode of carrying on its business. Subject only to the authority of government, its exclusive control of its tracks and vehicles of carriage is indispensable to its rights and duties, and this principle accords with sound public policy.

In law, cars used by a road in its ordinary business, however furnished, are deemed its own, and the rules of law respecting the responsibility of the company to the public for care and safety apply alike, whatever vehicles may be used or however acquired. If a railroad were under a compulsion to haul private cars when offered, very serious questions might arise as to its responsibility for the safety of cars, or for accidents resulting from ill-adapted cars defective safety appliances, or the like. The law therefore, here, as in England, where great attention has been given to the subject, leaves railroads free to haul or not to haul private cars in their discretion, but brings the conduct of the company under the obligations and restraints of public regulation, without regard to the kind of cars used or the mode in which they may be procured. The law for purposes of regulation recognizes only two classes to which its provisions apply. One consists of the carriers, whose function is to serve the public; the other is the whole public, whose right it is to be served; and the fundamental principle applicable to both is equality of service and charges under conditions that are substantially similar. There is no middle ground, nor an intermediate class to hold a dual relation as shippers and *quasi* partners of carriers, and so gain preferences over other shippers by sharing the earnings of the carriers as part of their profits as shippers. Shippers must stand on the same plane, and one shipper cannot secure to himself, by any pretext or device, a pecuniary advantage in transportation over other shippers. Every preference given by the acts of a carrier is under the ban of the law, and the methods by which it may be done are not material.

These observations lead to the particular point intended to be emphasized—the discriminations resulting from the use of cars of shippers. The method by which this is done is usually as follows:

A firm, or perhaps a combination, dealing in some article of commerce, not satisfied with the ordinary profits common to others engaged in like business, desires to augment its profits by some auxiliary means in which its rivals may not be able to compete. It thereupon builds a large number of cars, usually of some improved style not furnished by the carrier itself. A contract is then made with roads to haul these cars, the carrier to pay compensation for their use in the form of mileage, usually ¾ cent for every mile hauled, both loaded and empty, though sometimes more. Sometimes some additional allowance is made for some terminal matter, such as yardage, actual or constructive, for livestock.

Investigations made by the Interstate Commerce Commission have disclosed to some extent the very large sums received by shippers as mileage for the use of such cars. By an investigation in 1890 it appeared that private stock cars to the number of 250 had been used upon a line made up of two connecting roads between Chicago and New York, beginning with 150 cars on Sept. 1, 1888, increased 30 more a month later, 20 more another month later, and reaching the total of 250 in June, 1890; that the cars altogether had cost $156,500, and had earned for mileage in two years, from Sept. 1, 1888, to Sept. 1, 1890, $205,583; that the entire expense during that period for repairs and management was $34,050, leaving net revenue of $171,532, being an excess of $15,032 above the whole cost of the cars. The cars were therefore paid for and a margin besides in two years, and thereafter an income of upward of $100,000 a year was assured on an investment fully repaid, or in effect on no investment whatever.

It is obvious what advantages to a shipper furnishing cars such a revenue from their use affords him over a competitor shipping in cars belonging to the carriers. The latter pays the transportation charges in full; the former is reimbursed for a considerable part of these charges by the mileage received, while the other must carry on his business at a loss or be driven out of the market. By still other investigations at various times the gross discriminations that have characterized the transportation of petroleum oil in barrels and in tanks, in which payment for the use of tank cars has been a factor, have been developed. Thousands of such cars are owned by shippers and used exclusively for the carriage of their own soil. The injurious consequences have been very generally felt and observed. Dealers who have been obliged to ship in barrels in the box cars furnished by carriers have met with disaster and been largely forced to relinquish the business, while the tank shippers owning their own cars have enormously prospered and rapidly absorbed the business of their less favored competitors, until one great combination has become an overshadowing monopoly, representing fabulous wealth, with corresponding power and influence, able to command where other competitors must solicit—and too often solicit in vain—and accorded on the part of carriers an apparently eager subservience. . . . The revenues of carriers are seriously impaired by these payments, and it is not uncommon when rates are abnormally low that not even the cost of carriage is left to the road. The practice is therefore neither good transportation policy from the carriers' standpoint nor, in a larger sense, good public policy, which, as its essential feature, requires the absence of every form of favoritism and preference, and equal opportunities for enterprise and energy in the competitions of business, to the end that individual character—the state's chief security—may be developed and merit attains its just reward.

The railroads of the country are themselves responsible for the use of private cars and for the abuses that have resulted. The reluctance and even neglect of the roads to provide suitable and improved cars to meet the growing demands of commerce and carry certain kinds of traffic without injury to its usefulness and market value, at first impelled shippers themselves to do what the carriers should have done—to furnish cars suited to their business. The hauling of the shippers' cars then became a matter of competition among the roads, and they mistakenly adopted the plan of paying to shippers the same or even a greater mileage rate than the roads allow between themselves in the interchange of cars, where the allowances are reciprocal and for the most part substantially equalize each other. But in the case of shippers' cars there is no reciprocity. The money is paid directly to the shipper, and, to the extent that it exceeds current interest on the cost of the car and a fair allowance for depreciation, it is a direct loss to the carrier and a discrimination in favor of the shipper. The point now aimed at is the discrimination to shippers. This has become an evil of such proportions that it can no longer be disregarded, and a remedy is of urgent importance. Any plan involving the payment of mileage to shippers is evidently impracticable. No mileage basis can be fixed that will apply to different kinds of cars and that will effectually guard against discrimination. It doubtless is difficult to devise any plan that will be just and not liable to some abuse. In England, where many private cars are furnished by shippers, especially in the coal trade, a practice prevails of making an allowance to the car-owner for the tonnage carried; but obviously that method has defects and is open to abuse. If a radical change is impracticable, and if the practice of using cars of shippers and paying for their use is to continue, a feasible plan would seem to be that the payments in no case should exceed what the expense would be to the carrier if it owned the car—that is to say, the current interest on its cost and a just allowance for depreciation, and a right on the part of the carrier to use the cars for other shippers when their owners do not furnish loading—with the provision that all contracts for the use of such cars should be filed with the Interstate Commerce Commission and the reasonableness of the allowances be subject to its jurisdiction.

* Paper by Hon. Augustus Schoonmaker, read at the Convention of Railroad Commissioners at Washington, March 4; slightly condensed.

Blast Furnace Capacities in 1891.

The *American Manufacturer* returns 250 furnaces in blast, with a weekly capacity of 120,745 tons, and 284 furnaces, with a capacity of 122,706 tons out of blast. At the commencement of the year the capacity of the furnaces in blast was 164,281 tons; on Dec. 1 it was 181,452 tons, and we have to go back to August, 1888, to find so small an apparent output. Approximately, the output for the first two months of this year has been 1,188,132 gross tons, or 297,938 tons less than for the corresponding period of last year.

The approximate pig iron production for the first two months and for the years, with the percentage of the total make, is given below:

	Make for first two months.	Total make.	Percentage of total make made in first two months.
1888.....	1,084,815	6,489,738	16.72
1889.....	1,126,463	7,603,642	16.13
1890.....	1,486,070	9,202,703	16.15
1891.....	1,188,132	.....	.....

This looks as if our make for 1891 would be less than 8,000,000 tons; but considering the lack of commercial confidence consequent on the failures, past and expected, in connection with the Argentine loans, the coal miners' and cokers' strikes, and the shut down of the Valley furnaces, the environments of the past two or three months have been so peculiar as not to justify any reasoning based on the percentages above shown. It is hoped that with the reported sales of 1,000,000 tons of Lake Superior ore by the Norrie Mine and a slight hardening of prices, confidence will be be restored to the iron trade. All branches of textile manufacturing are better supplied with orders than usual. New mills are being built and old ones started up (a late number of *Bradstreet's* mentioned 14 new cotton mills, 12 of these in the South); but this, for some time, will have only an indirect influence on the iron market, so that it is doubtful if any decided advance in the present rate of production will be noted until June. From that time on, however, we are likely to see a very busy year in everything except railroad building, which will probably cut a small figure for this year, as the unloading of our securities held in the London and continental markets bids fair to be continuous and to absorb all the speculative money in Wall street.

Great Siberian Railroad.

From among three routes submitted, the Russian Government Railroad Commission has all but definitely settled upon the route from Miask to Nishni Oodinsk. The line will come to the ocean at Vladivostock, the future Sebastopol of the Pacific. The length of the whole line will be 4,765 miles, nearly twice as long as the Canadian Pacific. It is expected to take at least 10, and probably 12, years in building. The line will be constructed in six principal sections, and the longer of these will be divided into smaller sections. The average cost is computed at £7,680 per mile, including rolling stock.—*Herapath's.*

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

At the last meeting of the New England Railroad Club some of the business reasons for the constant increase in the power of locomotives were stated, and it was said that the limit of weight has been practically reached and that a further increase of power is to be had only by increasing the boiler pressure. This is hardly in accord with good philosophy and recent practice. A great deal has been said in late years about over-cylindered engines, and there has been a pretty general reduction of cylinder capacities, in proportion to the weight on the drivers, in order to bring the power of the cylinders and the adhesion more nearly to an equality. Of course everybody knows that the power of the locomotive can be increased by increasing the pressure only through the gain in cylinder power, which, while it increases the turning power on the cranks, does not increase the hauling capacity of the engine at all, unless the engine has sufficient weight for adhesion. In other words, if we want greater hauling capacity, we must increase the weight carried on the drivers. Then the cylinder power may be increased up to the limit of adhesion by making bigger cylinders, or by carrying higher pressure; but the main object in increasing the boiler pressure is economy of fuel and water. All this is elementary, and we only say it now because of the high standing of the gentleman who made the statement before the club. Undoubtedly, if he had expanded his idea, and said what he really meant, there would have been no occasion for this restatement of fundamental principles; but he explicitly confined his statement to freight service. The problem of designing a locomotive to do work at sustained high speeds is a different and more complicated one. The same speaker mentioned the necessity of higher pressures to get the full efficiency of compound locomotives. To get their greatest economy undoubtedly high pressures must be used; but it should not be lost sight of that the compound principle has a value for locomotive work independent of the steam pressure; that is, of two engines, one simple the other compound, having equal steam pressures, the compound will be the more economical if the published data of experiments are of any value. The great purpose of compounding locomotives is to increase the degree of expansion, which in locomotive practice is too small to be economical.

The causes of broken stay bolts are numerous but of very different force. In the discussion by the New England Railroad Club it was pointed out that they break next the outer sheet more often than next the inner sheet, because of the concentration of the bending movement there. This is quite just. Old boiler makers who have long watched for broken stay bolts say that breakage at the outer sheet is caused by the greater stiffness of that sheet, it generally being made thicker. When both the inner and the outer sheets are of equal thickness, and neither is stayed by other stays to make it stiffer than the other, the breakages are equal at both sheets. It is not uncommon in marine work, where two sheets of unequal thickness are stayed by screw stays, to find that the stiffness of the stay bolt is so much greater than that of the flat sheet into which it is screwed that the sheet itself bends rather than the bolt. This is made evident by the cracking off of the scale on the sheet around the bolt, and the consequent exposure of the clean metal, thus increasing the rate of oxidation. The sheets are found to be thinner about an inch away from the bolt than at the bolt because of this action. Almost invariably where flat surfaces are stayed by screw stays, and the sheets are of different thicknesses, the stay bolts will be found broken next the thicker sheet. For this there seems to be a sufficient reason, as the greater rigidity of the stay in the thicker sheet makes the inside of that sheet the point of maximum bending in the stay, and, therefore, the place where cracks would first take place, all other conditions being equal. The dangers incident to the use of screw stays do not appear from the list of exploded locomotive boilers, as the majority of ruptures take place at points no way affected by the screw stays, such as around the domes and at seams of the shell sheets. Of course the immunity from explosions caused by failures of screw stays is largely due to the systems of inspection of such stays which are almost universal on all of the railroads of the world. It is hardly a point against the screw stay that its reliability is dependent upon continued careful inspection, as the same is true of many other details of railroading, such as axles, wheels, frames and connecting rods. The periodical removal of stays after a definite period of service proposed by Mr. Lauder is probably an advisable course to pursue, as it is the only means by which one may be assured that the material in the bolts is reliable. It is common practice on some European roads to remove side rods and other details, more especially if of steel, after a definite service, when the conditions of use are such as to subject the material to repeated reversals of strains.

There is one clause in the Rules of Interchange which has stood unchanged for some 15 years. The fact that it has not been changed is in itself evidence that it is adequate; but we hear complaint of its injustice. That is the following paragraph from Rule 23:

> Depreciation due to age shall be estimated at six per cent. per annum upon the yearly depreciated value of bodies and trucks, provided, however, that allowances for depreciation shall in no case exceed 60 per cent. of the value new.

Estimates and statistics show that there is such a wide difference in the life of cars of different kinds that this basis of settlement is often unfair. For instance, one large road shows the life of cars to be as follows: Box, 15 years; stock cars, 10 years; flats and coal cars, 8 to 10 years. Another shows a large number of box cars which have been running from 18 to 20 years, while flats and coal cars give out in six to eight years, and ore cars have even a shorter life. If these figures represent the average throughout the country, a uniform six per cent. basis does not give a just standard for settlement. When this rule was adopted the great preponderance of long-life cars made it essentially fair; or rather there was less variety than there is now in the kind of cars and their endurance. So the rule was sufficiently accurate for all practical purposes, and had the great advantage of decreasing the clerical labor incident to settlement. Since that time, however, the relative number of stock, ore and coal cars has greatly increased, and the opinion has been established, among a few master car builders at least, that there should be different scales of depreciation for cars of different service.

The managers of the Fourth avenue tunnel might have prevented a part of the numerous adverse criticisms put forward in consequence of the collision of Feb. 20 if they had had stricter regulations for the management of the Sykes locks. It will be remembered that, according to the evidence brought out, operators when finding themselves "locked up" in consequence of derangement of the apparatus, could unlock themselves so easily that with a lazy or evil-disposed man the interlocking apparatus was of very little value. There is a hole in the top of the cabinet holding the electro-magnets, and the armatures of the latter could, by means of a common lead-pencil, be moved at any time. Every practical man admits that to avoid delays of trains signalmen must always have some means of suspending the rigid rule. For instance, many block operators have instructions, when a semaphore is locked so as to be beyond control, to let trains pass it by a flag signal. Correct practice in this matter demands, however, that every such deviation from the usual methods be made as difficult as possible. If it were practical to compel an operator to walk twice around his building, or to count 50, or perform some other operation which would surely take time and give him a chance to reflect, it would doubtless be a good thing. The least that can be done in such case is to put the apparatus under lock and key, so that the operator must move from his usual position and go through some unusual proceeding, taking an appreciable length of time, in order to vary the rule. A simple method, which is well known, is to place a seal, like an ordinary freight-car seal, on the fastening to the instrument case, thus compelling a record each time the instruments are unlocked. The seal illustrated on another page of this paper would be suitable for such a purpose. It is true that the inspectors would have to break the seal occasionally, and that a high state of discipline would be necessary to prevent operators sending forward a number of trains without the protection of the automatic lock when once the seal was broken for a single train. But, then, high discipline is necessary for good block signaling in any event; and the knowledge that one's movements are to be known and placed on record is salutary for signalmen as well as for rate-makers.

Anthracite Coal Rates.

The great case of Coxe Brothers against the Lehigh Valley has resulted in a draw. The complainants have been beaten on questions of principle, but the railroad has been ordered to reduce its rates.

The grounds of complaint were, first, that anthracite coal was classed higher than bituminous, or charged higher commodity rates; second, that the rates on anthracite were disproportionate to the distance, being in many instances higher than those on general freight; third, that the relations between the railroad and the Lehigh Valley Coal Company were such that these high rates were made a means of discrimination against independent mine owners. As a result of all these facts it was charged that the market for anthracite coal in general, and for that of Coxe Brothers in particular, was artificially restricted.

The Commission has decided, in the first place, that it is not necessary to class anthracite and bituminous coal at the same rates. This is no more than good common sense; but it is worthy of praise, because it is in direct conflict with English decisions on the same question. The complainants urged that different grades of coal compete pretty directly with one another, and that the cost of service is not widely different in the different grades—perhaps in some respects less for the higher than for the lower. They therefore claimed that any difference in favor of bituminous and against anthracite is discrimination. But the Commission takes a broader view. It shows that the same reasoning adopted by the complainants would make it necessary to class smaller sizes of anthracite as high as larger ones, and that this forced equality of articles of different value would produce waste and loss from a public standpoint.

> The result of classifying and rating all coal, including the lower grades or smaller sizes, as one freight would be that the smaller anthracite coals at the increased rate would be at still greater disadvantage than they now are, and for ordinary steaming would be cut out by bituminors, while for the uses in which anthracite is indispensable the larger sizes, at the same rate, would displace the smaller. The consequence would be that 25 per cent. in quantity, or about 16 per cent. in present value of all anthracite mined, would be unable to bear the burden of transportation, and would be waste until such time as it could be locally converted into power and the power transmitted. There is, therefore, for the present no hardship, but economy, in making the best bear some of the burden of the inferior, which is not a voluntary but a resulting production. To determine otherwise and make waste of lower grades is to impose on the higher grades the entire cost of producing both. The result would be to largely increase the cost of production and the price of merchantable anthracite, and make waste of about one-fourth of all that is mined.

We have never seen a clearer defense of the principle of charging what the traffic will bear.

The examination of the absolute rates charged on anthracite coal raises another and, in some respects, more perplexing set of questions. The rate of $1.80 per long ton from the Lehigh coal region to Perth Amboy, a distance of about 135 miles, is made the special object of attack. This seems a very high rate, considering the conditions of the traffic; and the relations between the railroad and the coal company which it owns are such as to raise the suspicion that it is unfairly high; for the railroad, by charging itself a very high rate, can make enough on the freight to afford to lose, as a producer. If the railroad and the coal company are, in the last analysis, the same person, the only point which concerns them is to have the price of coal at tidewater high enough to cover the cost of production and transportation together. If coal sells for $3.25 a ton at tidewater, it makes no difference how this sum is divided, if the railroad company is at once miner and carrier. If it is fair to give

the carrier $1.50 and the miner $1.75, and the railroad actually charges $1.80 and leaves the coal company only $1.45, the loss of 30 cents in the latter case is made up by the surplus profit in the former. The distribution of profits to one branch of business or the other is only a matter of book-keeping. But if we are dealing with an independent mine owner, the case is wholly altered. The 30 cents extra profit to the road means 30 cents loss to the mine. A high rate becomes a means of destructive discrimination against the independent miner, and in favor of the railroad company itself in its capacity as a coal miner.

This difficulty would have been avoided if the railroads had from the outset confined themselves to their business as carriers, and not mined coal for the general market. But the Commission was not dealing with an ideal state of things. It was forced to take facts as it found them. It could not prohibit the railroads from engaging in a business to which they had a prescriptive right, however great the evils attendant upon it. It therefore stretched its jurisdiction in the matter of rates and prescribed a reduction. That the order in the present case was fair, and that the special circumstances warranted it, seems to us altogether probable. It remains to be seen how far the Commissioners, having taken jurisdiction in this case, can avoid doing so in cases where they would much rather be excused from the task.

The Lease of the Rome, Watertown & Ogdensburg.

The lease of this road to the New York Central closes the one chapter of current railway history that has been interesting railroad men and the public for some time. The Rome system of owned and leased roads comprises 643 miles, and earned last year nearly four millions gross and a million and a half net. After paying interest, taxes and rentals of about a million, the company paid six per cent. dividends and had a surplus, after charging to operating expenses the cost of some of the betterments.

Mr. Charles Parsons and friends bought control of the old Rome, Watertown & Ogdensburg several years ago when it was not earning anything, leased its only competitor, the Utica & Black River, and went energetically to work to strengthen and develop the system. From a mere branch, wholly dependent upon connections, they brought it up to independency, turned some little New England local traffic away from the Central over the northern route, competed with the Central for freight and passengers at Rochester and Suspension Bridge, and would soon have been in Buffalo.

In addition to these losses to the New York Central, aggregating a traffic worth saving, the Canadian Pacific was understood to be negotiating for the Rome road. This company now uses the Rome road from Ogdensburg to the Mohawk River for its New York line, and by building a few miles could also have made a direct connection from Niagara Falls to the Fitchburg, near Schenectady. In short, by controlling the Rome road the New York Central brings back its lost traffic and prevents serious losses which would inevitably have come upon it had that road fallen into the hands of the Canadian company.

To affect the price to be paid, and also to be prepared for war should the Rome road sell out to any other company, the New York Central procured a charter for a parallel line to Watertown, which will not now be built. The nominal reason given for obtaining this charter was that the Rome, Watertown & Ogdensburg charges were extortionately high. These averaged on local freight 1.3 cents per ton per mile, and on local passengers 2.4 cents per mile. Some individual cases show higher rates, as, for example, 2 cents per ton per mile on certain coal shipments. The new owners will no doubt feel themselves bound to reduce these rates to figures nearer their own tariffs, but will make up the difference by the additional traffic turned to their own lines, by economies in operating, and more than all else by stopping destructive competition. The New York Central has agreed to guarantee five per cent. dividends after allowing present owners of Rome stock to declare a 20 per cent. stock dividend. This is equivalent to six per cent. upon the present stock, but gives the present holders the advantage of the one per cent., making the stock worth to them nearly 135.

No doubt the lessees will permit the Canadian Pacific to continue using the Rome, Watertown & Ogdensburg for New York City traffic, though they may in time turn that traffic away from the New York, Ontario & Western and send it over the West Shore. Vice-President Webb has conducted a careful campaign, and doubtless the Central will use its victory wisely. In this view the public will be benefited by the practical consolidation much more than if two or three extra and useless roads were to be built through Northern New York. There is now a chance for a fair profit to the new owners, even after reductions of rates and improvements in service, which could not otherwise have been the case. The lease of the Rome road has upset the old established state of things in New York, and further important changes may be the outcome. How matters will arrange themselves it is yet too early to predict. The New York, Ontario & Western uses the Rome road, not only for Canadian Pacific traffic, but also as its connection for through traffic with the Grand Trunk at Suspension Bridge. But there is as yet no reason to believe that the New York Central will shut off this connection of its weaker neighbor, or hamper its operation in any way. Recent "solemnizing" events have led to a number of instances of forebearance on the part of strong lines toward their smaller brethren, and it is to be hoped that the restraining influences now in the air will continue to be felt.

Use and Abuse of Fixed Signals.

It will be noticed that one of the collisions reported in our English accident record printed in this issue, that at Clara, Ireland, was caused primarily by an engineer disregarding a home signal, and secondarily, according to the inspector, by the practice of switching on the main track when a passenger train was due. Occupying the main track at stations when a passenger train is due is a frequent cause of trouble in this country; but in our case, the great majority of American yards being without any protection by fixed signals, this can generally be called the main cause instead of a secondary one, and we speak of this case merely to call attention to the fact that the British roads, with all their costly protective apparatus, still fail to get the full benefit of it.

Where there is no way of protecting a yard engine except by flagging, and nothing but the time-interval system for keeping passenger trains apart, the prompt handling of passenger trains necessitates rigid regulations for making yard engines keep well out of their way, and the time and money thus wasted must be counted as a necessary loss incident to the use of such a system. But one of the chief reasons for putting in fixed signals and block systems is to save this time and money. Safety to passengers and employés is indeed the first reason, but it is by no means the only one. If there were no other motive for making the improvements named there would not now be half so many of them as there are. The saving in time effected by blocking and interlocking is made possible by the division of the track into well-defined sections and the establishment of a rigid rule that runners may proceed at full speed *to* a home signal, but *never* beyond it when it is at danger. It is from the prevalence of loose ideas concerning these elementary conditions that English railroad men still tolerate practices that are not the best; and American officers who are introducing or improving fixed signals should be careful not to follow the foreign practice without first testing it, by a little plain common sense. We can learn many profitable lessons in conservatism over there, but not all that appear to be profitable are so in reality.

Home signals are used in at least some places on probably every road, under strict rules. An engineman must *never* pass them while they are at danger. This implies that when in that position a train beyond the signal is fully protected by it. But if we tell the latter train that it is *not* fully protected by such a signal, we surely tell the other train that it is not expected to invariably obey the signal. We do not tell this in words, but the message is inevitably conveyed nevertheless. Here is a grade crossing of another road; every runner knows that he must implicitly obey the signal protecting it. At the next station is a branch junction, with frequent passenger trains using it; these signals must be equally respected. At either place the signalman uses perfectly free discretion, never making one train wait unnecessarily for another, never holding a freight for a passenger unless the latter is actually on hand to use its rights; and no train ever flags against another. But at the next station, or possibly in the same yard with a such junction or crossing, is a switch with precisely the same kind of signal as those at the junction, but which the rules say must not be used without first sending out a flag, and never within 10 minutes of the time of a passenger train. How can this be regarded as anything but glaring inconsistency? The only possible justification for such practice is the principle of the old custom that, in the absence of fixed signals, enginemen must look out for themselves where there is much liability to be stopped, and obstructors of the track must do the looking out where there is little likelihood of stopping regular trains. But here is just the point; the establishment of fixed signals is for the express purpose of removing this distinction, of making the entire abolition of flagging possible; and a continuance of the old regulations, either wholly or partially, simply helps, as far as it goes, to defeat the purpose which was or should have been in view when the improvement was made. It should be held as an axiom that the establishment of fixed signals at any station, no matter how small it may be, at once places it on an equality, in this particular, with the most important junction or yard on the line.

Railroads Through South-Central Brazil.

A recent issue of the *Rio News* announces another hastily conceived Brazilian project in the following paragraph:

"The governors of Pará and Matto Grosso are calling for tenders for opening a road between Itaituba or Santarem and Cuyabá. Tenders will be received up to June 20, and seven per cent. interest is guaranteed on the capital invested in the road."

The spirit of this enterprise is praiseworthy enough, for it is sufficiently evident that the great province, or State, of Matto Grosso should have an outlet for its products through Brazilian territory, instead of being compelled, as at present, to reach the markets of the world by a circuitous route far to the southward, by way of Buenos Ayres.

It would seem, however, that the governors of Pará and Matto Grosso had not well considered their problem. The town of Itaituba is situated just below the first cataract on the Rio Tapajós, about 160 miles south of Santarem, which city lies at the junction of the Tapajós and the Amazon, and the distance in an air line from Cuyabá to Itaituba is 760 miles. The intervening country is hilly, and covered with tropical jungles, conditions most unfavorable for railroad construction. For a distance of 600 miles there are no towns, and the region possesses no possible attractions for immigrants. It is difficult to see any legitimate reasons for building such a line. Matto Grosso, however, possesses resources rich enough to warrant the construction of a railroad to the coast, which in time must inevitably be done, and it would be rational to locate a route eastward through the isolated state of Goyaz to connect with the Dom Pedro II. railroad at Ouro Preto in the state of Minas Geraes. The distance in this case would not exceed 850 miles. The country is open; is already partially settled; is exceedingly healthy; produces some of the finest cattle in South America, and is naturally adapted to the cultivation of the Manihot or "Ceará" rubber tree, which could be made enormously profitable.

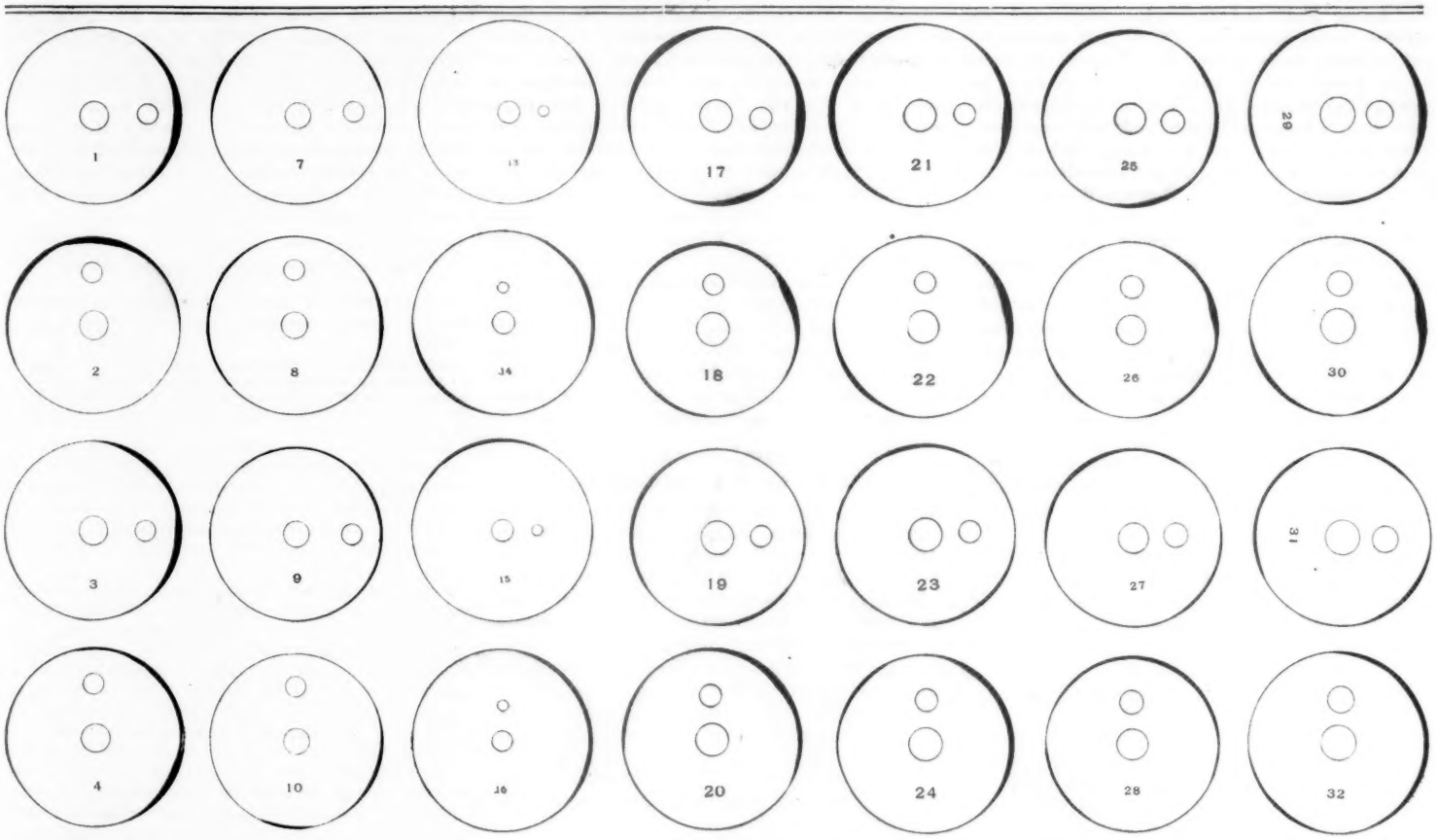
Matto Grosso and Goyaz have furthermore been famous for many decades for their mineral wealth, which would unquestionably create important mining industries under the encouragement of improved facilities for transportation. The extension of a railroad westwardly from Ouro Preto would be through a region every mile of which could be made productive, affording abundant traffic.

Such an enterprise might well engage the serious attention of capitalists, if favorable grants could be obtained. Brazilian legislation, unfortunately, has raised many difficulties in the way of developing the resources of the new republic, which must discourage ventures of this kind until wiser counsels prevail. Full control of public lands has been vested in the several states, so that the general government has not an acre at its disposal. A railroad company could not, consequently, enjoy any colonization privileges unless it secured suitable grants from the different states traversed by its lines. The legislative difficulties are thus increased, to which must be added the existing uncertainty in the balance between the rights of the states and the central government. In this condition of affairs there is little present prospect of developing the splendid possibilities of the great interior portions of the republic; but when Brazilian law has crystallized into more definite form Matto Grosso and Goyaz will certainly become the centres of vast commercial operations.

Records of Flat Spots on Driving Tires to Date.

It is evident, from an inspection of the three sets of data which we have published regarding the occurrence and location of flat spots on the tires of locomotive driving wheels, that there is no strict uniformity in their location relative to the crank. It would also appear that the flat places are in some way connected with the counterbalancing, and the turning moment applied to the axle by the connecting rods, and it is possibly somewhat affected by the angularity of the main rod and the total weight upon the drivers. Owing to the complexity of the conditions and the variety of positions which the flat spots assume on the circumference of the tire, there is of course no possibility of establishing definite conclusions from the comparatively small amount of data at hand; but the information can be put in such form that the different observations made can be readily compared and rendered quickly available for future reference when other data is obtained.

This we have done, and the diagrams 1 to 32 show the driving wheels all reduced to the same diameter, and the flat spots on the tires, greatly magnified as to thickness, but correct as to angular location with reference to the crank pin. The flat spots on the C., B. & Q. mogul, class



DIAGRAMS SHOWING IRREGULAR WEAR OF LOCOMOTIVE TIRES.

1 to 6, C., B. & Q. mogul before correcting counterbalancing; 7 to 12, C., B. & Q. mogul after correcting counterbalancing; 13 to 16, C., M. & St. P. 8-wheelers; 17 to 32, C., B. & N. 8-wheelers.

"H," were given in the *Railroad Gazette* Aug. 1, 1890, but were then shown by developing the tire on a flat surface, and were not therefore directly comparable with the records given by Mr. Barr from the Chicago, Milwaukee & St. Paul in his paper before the Western Railway Club, or with those given by Mr. Lewis, of the Chicago, Burlington & Northern, in his discussion of that paper. As now presented, the spots are all shown in the same arrangement, which is, as they would all appear if an observer stood on the right-hand side of the engines, and while seeing directly the spots on the right-hand wheels could look across the engine to the spots on the left side also. The direction of rotation is the same as the hands of a watch, and the crank pin position is taken as that when the right-hand crank is on the forward dead centre.

The first and second lines across the page contain all of the records yet obtained from right and left main driver tires; the third and fourth all from the right and left rear driver tires; the fifth and sixth all from front driver tires on mogul engines.

The C., B. & Q. tires are shown twice, before and after being turned because of flat spots, the counterbalancing being changed materially between the records; it having been found to be incorrect when examined at the time when the first records were taken, ence these diagrams show the effect on the positions of the flat spots made by correcting the counterbalancing. The flat spots on the locomotives on the C., B. & Q. and the C., M. & St. P. are somewhat differently located from those on C., B. & N., and this may possibly be wholly accounted for by the difference in counterbalancing.

That the counterbalancing does affect the location of the spots is quite clearly shown by comparing the diagrams 1 to 3 with 7 to 12, which show the irregularity of the contour of the tires before and after changing the balancing.

There are two strong tendencies toward flat spots shown by these diagrams; one when the right-hand crank is at the rail, the other when the right-hand crank is about 45 degrees ahead of the back dead centre; also, on the left-hand wheels a tendency to flatness when the left crank is 45 degrees ahead of the back dead centre. There is on all of the right main drivers a tendency to flatness opposite the crank pin, and a corresponding flat place is found on the left-hand main wheels, which is at the same angular position relative to the right-hand crank, and hence 90 degrees ahead of the left-hand crank. Therefore, these spots on the right and left tire are on the rails at the same time.

There are flat spots on the right main tires of the C., B. & N. engines which have no counterpart on the left tires of those engines, but flat spots are there found at a different angle.

Other flat spots occur, but they seem from the records to be either accidental or the result of an acknowledged improper counterbalance, and as we have said, nothing is really proved by the flat spot statistics thus far obtained, but some general tendencies are observable.

So far as we can ascertain, the situation of the affairs of the Union Switch & Signal Company is about this: After the annual election at which the directors and officers in the Westinghouse interest were deposed, and upon the return of Mr. Westinghouse to Pittsburgh, it developed that the new directors had not made provision for maintaining the company's credit in Pittsburgh, where the banks hold call loans of the company for a considerable amount. In conference with Mr. Waters, one of the new Boston directors, Mr. Westinghouse disavowed any intention of contesting the election, and expressed the hope that the new management would care for the company's finances without asking assistance from him. In the event of their failure to do so, he is prepared to reorganize the company in such a way as to guard the interests of all in an equitable manner. Mr. Rowand resigned the presidency and Mr. Goodman succeeded him; but this was not at the suggestion or request of Mr. Westinghouse, and not at all in the nature of a "compromise," as it has been said in the daily papers. There has never been a time when the outlook of the signaling business was better than it is now; and the patents, devices, plant and experience of the Union Switch & Signal Company combine to put it in a position to do a great and profitable business in the next ten years. The ground has been hardly more than broken in the application of signaling in the United States; and it is not only supposable, but probable, that the business done by the signal companies in the next decade will be several times greater than all that they have done up to the present. We may hope, therefore, that the Union Switch & Signal Company, which has been the pioneer, and has prepared the way, will now be able to profit by its heavy investments of work and money.

Those who have followed the discussions at the Western Railway Club remember the statements there made regarding the cost of repairs to various parts of freight cars. The statement was made by Mr. Peck, Master Mechanic of the Belt Line, Chicago, that the cost of repairs to the draft rigging of different types of cars was greater than for all other parts together. This applied, of course, to the repairs to the structure only, and did not include the renewals of wheels, axles and brasses. The position which Mr. Peck occupies makes him familiar with a larger variety of cars and more types of construction than the average master car builder can ever see. Hence, his statements may be taken as having considerable weight. It may not be essential that we should know exactly what is the distribution of the cost of repairs over the different details of the car body, but such knowledge is convenient and of undoubted usefulness to designers of cars. But few statistics relative to this have been made public, and such as have been are imperfect. It would be of advantage to those interested in car building and in the perfection of car details if sufficient interest in the subject could be raised to induce master car builders to make public any data they may have collected. Mr. E. C. Spaulding, before the Car Accountants' Convention in Buffalo, in 1886, gave as the proportion of expense of renewals and repairs to bodies and trucks of cars, including wheels, brasses and axles, at about ¾ for the trucks and ¼ for the bodies. He also gave the relative amount expended for lumber, metals and paint, etc., but did not mention the different details for which this material was used. An officer of a large system has given us the percentage of cost of repairs of the different details of the bodies, as follows:

	Box.	Stock.	Flats.
Body bolster	8	4	5
End sill	10	12	18
Side and intermediate sills—2 sills	20	24	38
Centre sill	12	12	17
Draft timber	15	8	12
Post and braces	2	8	—
Siding	10	3	—
Doors	3	4	—
Roof	10	10	—
Flooring	10	15	10
	100	100	100

The policy of retrenchment on the Chicago, Burlington & Quincy has brought about some changes which are of very doubtful economy. Among other things the Bureau of Car and Special Freight Service has been given up and the clerical force distributed between the car department and the general freight department. The work of that bureau still remains under the control of Mr. Ross, and perhaps he is not so much hampered but that he can carry it forward with nearly its past efficiency. The value of the Aurora laboratory must, however, be considerably diminished by the changes. The chemical laboratory has been abandoned, and the department of mechanical tests placed under Mr. Forsyth, the mechanical engineer, and the force reduced. We do not know how much is saved on the salary account by this change, but we venture to say that this laboratory has yearly saved to the C., B. & Q. its operating cost many times over.

Combinations of railroad employés to resist legislation hostile to the railroads are still reported. The latest movement of the sort that we hear of is in Bloomington, Ill., where it is proposed to organize a political association of railroad employés in the vicinity. There are said to be about 2,000 of them in that neighborhood. The call for the organization places the necessity for it on the ground that the unreasonable and hostile granger legislation has re-

sulted in reducing the number of men employed on railroads and reducing the hours that they are employed, thus cutting down their wages. The result, it is said, is that many good mechanics and railroad men are tramping the country seeking employment.

Engineer Hayden, of the —— road, had been upon his train 27 hours when he reached —— Saturday night. There he received an order to do some extra work, and promptly telegraphed that he was exhausted, being hardly able to finish his trip. "You must," was the answer that came from headquarters. Engineer Hayden stepped down from his cab, bought a ticket and took the next up train, and this was the dispatch that was posted at the division terminal that night:

Conductors—Do not allow Engineer Hayden to ride away from —— unless he pays his fare.

—— Div. Supt.

Mr. Hayden was one of the oldest engineers on the road, but he is now looking for a job where 18 or 20 hours will pass for a day's work.—*Exchange.*

Not knowing all the particulars we refrain from comment on the above; but the most favorable view (for the division superintendent) would seem to suggest the query whether a road having an engineman whom it was necessary and proper to discipline so harshly ought not to have got rid of him long before he became "one of the oldest engineers on the road."

The Kansas legislature has adjourned without passing any of the proposed rate laws or other bills concerning railroad operation, the conservatism of the Senate checking the radical action of the lower house. In Nebraska, also, the two-cent passenger fare bill has been practically killed by the Senate.

NEW PUBLICATIONS.

Journal of the Franklin Institute. March, 1891.

The paper which will, perhaps, attract the most general interest in this issue is the Aluminum Problem, by Joseph W. Richards, Instructor in Metallurgy, etc., Lehigh University. This is a lecture delivered before the Institute last January. It is largely historical. Mr. Richards' conclusion is that very satisfactory progress has been made in the commercial production of aluminum. "Six years ago it sold for $12 a pound, three years ago for $5; to-day it is being sold at $1.50, and before this year is out it will probably be down to $1." Mr. Richards' prediction has been verified more quickly than he could have anticipated, inasmuch as aluminum is already advertised at $1 a pound.

Elements of Trigonometry, with Logarithmic and other Tables. By M. H. Ludlow, First Lieutenant Third Artillery, U. S. A., with the co-operation of Colonel Edgar M. Bass, professor of mathematics, U. S. Military Academy. Third edition. New York: John Wiley & Sons. 1891. Price $3.

This is a text book of plane and spherical trigonometry with extended tables of logarithms, natural sines, etc., squares and square roots and various trigonometric formulæ. The first part occupies 174 pages and the tables 90 pages.

Journal of the Association of Engineering Societies. February, 1891.

The papers in this issue are the Retiring Address of President Cooley, of the Western Society, on the Modern Spirit of the Engineering Profession; The Multiple Dispatch Railway, by Max E. Schmidt, and Construction and Operation of Cable and Electric Railways, by H. M. Kerby.

Second Biennial Report of the Bureau of Labor Statistics, State of Minnesota. John Lamb, Commissioner.

The Topics treated are: School Attendance, Child Labor, Manual and Technical Training, Workingmen's Earnings and Expenses, Mine Inspection and State Labor Laws.

TRADE CATALOGUES.

Estrat d General Catalogue of the Sturtevant Blowers, xhausters, etc. B. F. Sturtevant Co., Boston, Mass.

This is a pamphlet of 200 pages, with an index. It contains illustrations, descriptions and price lists of a very great variety of heating and ventilating apparatus, together with a number of useful tables of the properties of steam, etc. The following is from the preface: "The first comprehensive and authentic tables and diagrams relating to the action of air under pressure, and to the speeds, pressures, capacities and powers required upon all classes of blowers, were published in our celebrated catalogues of 1870 and 1873. The information and tables therein contained have formed the basis of all computations of the movement of the air by fans, and have been extensively copied, but not originated, by other manufacturers. The constant demand by engineers for these tables led to their careful revision and the introduction of much new material, and they are here presented as the only authentic data relating to fan blowers."

Messrs. Byram & Co., of Detroit, have issued their sixth annual edition of "The Story of the Year, interesting and instructive especially to Foundrymen." This consists of a beautifully printed record of the names and addresses of purchasers during 1890 of the Colliau cupola furnace. It appears that the total number sold is 451, of which 92 were sold in 1890, distributed among 26 states and Canadian provinces—from California to New Foundland, and from Quebec to Texas.

Price List of Improved Hydraulic Jacks, Screw and Lever Jacks, etc. Watson & Stillman, 204 to 210 East Forty-third street, New York City.

This pamphlet contains a pretty careful description of the improved hydraulic jack, with directions for use and repair of such jacks. The firm makes jacks for almost every possible use, also the Tonkin flue expander and other special tools.

The J. G. Brill Company, manufacturers of railroad and tramway cars, Philadelphia, has issued a new catalogue of tramway car supplies. It contains good cuts of all the details for horse, cable and electric street cars, as well as descriptions. The catalogue is bound in cloth, has 128 pages, 10 and 14 inches.

Illustrated Catalogue of Williams, White & Co., Moline, Ill.

This catalogue shows bulldozers, spring hammers, drop presses, punching and shearing machines, together with several special tools not intended for railroad shops.

Catalogue of Tubular Well Supplies, by the Cook Well Co., 703 and 705 Market street, St. Louis, Mo.

A considerable variety of tools, pumps, tubing, etc., for tubular wells is shown in the catalogue of the Cook company.

Our Exports of Railroad Material.

In an article printed slightly less than four years ago the *Railroad Gazette* gave a table showing our exports of locomotives for the fiscal years 1875 to 1886, both inclusive, which we reproduce and bring down to the present time:

Fiscal year ending with June 31.	No.	Value	Fiscal year ending with June 31.	No.	Value.
1875	79	$996,639	1884	282	2,819,946
1876	44	561.559	1885	85	742,403
1877	53	568,302	1886	52	333,393
1878	98	1,016,974	1887	58	373,245
1879	73	567,802	1888	56	407,014
1880	60	466 313	1889	144	1,227,149
1881	99	893,123	1890	161	1,280,606
1882	133	1,455,717			
1883	219	2,219,081		1,696	$15,929,266

As a mode of exporting farm produce our foreign trade in locomotives has been a success, for there must have been many a bushel of wheat and quarter of beef involved in constructing the million dollars' worth we have sent out of the country each year, to say nothing of car fares and house rents, items which do not appear in the statistics of foreign commerce.

At the close of the fiscal year 1886 we had sent 371 locomotives to British colonies; since that the patriotic tom-tom has been beaten for all it was worth in the colonies, with the result that in the past four years only 24 locomotives have been shipped to those countries. This, however, was a strained effect which could not last, and a single order is now in hand for 24 locomotives for Australia. Two hundred and eight locomotives have been shipped to South American countries during the same time, bringing our total shipments to those countries up to 680. One hundred and seventy-nine had been shipped to Mexico up to 1886, and 88 are recorded since; though the number may be misleading, as the returns of exports by railroad into Mexico, as well as Canada, are exceedingly untrustworthy.

A late number of Bradstreet's tabulates our leading domestic exports for the past six years, from which the following is abstracted:

Table showing value of leading exports of manufactured products from the United States for years ending with January 31:

	1885.	1886.	1887.
Agricultural implements	$2,532,236	$2,119,772	$2,427,835
Carriages, horse and other cars	1,957,039	1,929,148	1,910,860
Copper, ore and manufactured	7,887,007	4,386,322	4,114,456
Manufactures of iron and steel	16,622,511	14,865,087	16,235,022
Wood and manufactures of	21,328,057	19,241,534	20,901,157
Sum of above	50,326,850	42,541,863	45,589,330
Total value of exports of domestic merchandise	$673,593,506	$699,519,430	$703,319,692

	1888.	1889.	1890.
Agricultural implements	$2,759,615	$4,246,079	$3,264,995
Carriages, horse and other cars	2,701,883	3,962.212	5,276,865
Copper, ore and manufactured	11,897,240	10,209,722	5,918,395
Manufactures of iron and steel	19,578,489	23,712,814	27,000,134
Wood and manufactures of	24,860,249	28,811,898	27,904,024
Sum of above	61,797,476	70,942,725	69,364,413
Total value of exports of domestic merchandise	$679,597,477	$814,154,864	$845,987,711

	Carriages and horse cars.	Freight and passenger cars.		Car wheels.		Iron and steel rails.	Fire engines		Locomotives.		Stationary engines.		Boilers and parts of engines.
	Value.	No.	Value.	No.	Value.	Value.	No.	Value.	No.	Value.	No.	Value.	Value.
1885	1,495,475	563	369,053	10.533	92,698	248,685	9	19,134	85	742,403	109	137,675	199.035
1886	1,340,198	867	587,692	10,612	86,610	170,112	6	6,889	52	333,393	154	123,270	327,199
1887	1,454,101	1,106	653,298	12,598	98,865	92,726	3	9,083	58	373,245	219	213,060	281,790
1888	1,381 291	794	862,465	11.909	108,882	178,267	2	1,300	56	407,014	268	197 040	238,726
1889	1,664.284	1,519	1,426,237	8,516	74,465	7,638	5	10,1 5	144	1 227,149	229	133,473	276,394
1890	2,056,980	3.662	2,689,698	12,216	103,782	346,164	6	9,439	161	1,280,606	291	305,478	570,915

This shows a more steady business than is done in locomotives. The items of most interest in the above table are given for years ending with June 30, instead of Dec. 31, below.

Carriages and horse cars are not separated in the statistical returns, and it is impossible to say what proportion of the item under that head is chargeable to horse cars. As we will probably ship an increasing number of electric cars, it would be convenient if the two items were separated in the future.

The last report on the foreign commerce of the United States presents a table under three headings showing the exports of domestic merchandise from 1860; their absolute and relative amounts for the decennial years are given below:

	Products of agriculture.		Products of manufactures		Products of mining, forest and fisheries.		Exports of domestic gold and silver.
	Value.	P. c.	Value.	P. c.	Value.	P. c.	
1860.	$256,560,972	81.14	$45,658,873	14.43	$14,022,578	4.43	$56,946,851
1870.	361,188,483	79.34	47,921,154	10.53	46,098,704	10.13	43 883,803
1880.	685,961,091	83.25	79,510,447	9.65	58,474 815	7.10	9,347,893
1890.	629,785,917	74.51	151,131,297	17.88	64,376,614	7.61	35,782,189

It will be noticed that the values of non-agricultural products exported are increasing faster than those of the purely agricultural productions, while the grand total has increased in value from 316 to 845 million dollars.

It will be noticed that no agricultural products are classed as products of manufactures, but the reasons for denying to a side of bacon or a firkin of butter an equal standing with a ton of pig iron, as a manufactured product, are not immediately apparent to the non-statistical mind.

TECHNICAL.

Manufacturing and Business.

At the annual meeting of the stockholders of the Louisville Bridge & Iron Co., recently held at its office, corner Eleventh and Oldham streets, Louisville, Ky., the following directors were elected: James W. Ainslie, Albert Fink, E. Benjamin, Albert Ainslie, Heywood Cochran, James M. Johnson and F. H. Vaughan. At the meeting of the Directors James W. Ainslie declined re-election to the Presidency, and the following officers were elected: J. M. Johnson, President and Engineer; E. Benjamin, Vice-President, and F. H. Vaughan, Secretary and Treasurer.

At the Reading Rolling Mills of Cofrode & Saylor angle irons have recently been rolled 4 × 4 in., ½ in. thick and 123 ft. long.

The Sampson Cordage Works, of Boston, have always given considerable attention to their yarn department, and the yarn used in their bell cords has been made under their own supervision. Recently new machinery has been put in in the card room and several other improvements have been made, so that a much increased product has been secured.

The Rail Market.

Steel Rails.—Orders aggregating 20,000 tons are reported by the Chicago mills, representing business which has been in the market for some time. The Edgar Thomson mill has not yet been started, and no orders are reported by the other Eastern mills. The quotations seem to be maintained firmly, however. In New York $30.75@$31 is quoted, and at Chicago $31.

Old Rails.—The quotations are: In the East, $21@$21.50, at Pittsburgh, $25, and at Chicago, $23@$23.25 for old iron rails.

Sheet Steel Journal Boxes.

In England and the colonies sheet steel is used quite extensively for the journal boxes of cars, and the success with them is so satisfactory that they bid fair to replace entirely the cast boxes. The best form of box is made by the Patent Stamped Railway Axle Box Co.'s works at Orchard Place, Blackwall, where these boxes are made on a large scale by stamping the shapes and welding the sections together. There are more broken axle boxes per year per car on English roads than on American, for the reason that the boxes on English cars are subjected to greater stresses, and it is to reduce the number of breakages without increasing the weight that the sheet steel box has been brought out. The saving in weight is about two-thirds, while the breakages are reduced to almost nothing. Such a box would do well here if one could be arranged to interchange exactly with the M. C. B. standard type.

Steam Heating.

Apropos of the safety of passengers in wrecks where steam heat is used is the following extract from a letter sent us by a correspondent who was present at a recent wreck in Ohio:

"Our train was pulling into a siding to let the eastbound express pass, but it came along before we could get out of the way at such a speed that the driver could not stop it. The express scraped a side of the third car for about half its length, tearing away the truss rod, but not throwing the car from the track. The engine caught the fourth and last car under the front corner, smashing the sills and floors into kindling wood and throwing the fire-proof heater forward on its face. The bottom of the coil drum was driven back about 6 in. without breaking the pipe connections. The engine struck the corner of the car in which the heater was placed. The blow was sufficient to throw the car over on its side in a ditch. The steam in the car was let out through the coupling, which was

parted. There is no question but that there would have been a fire if it had been a stove-heated car, as no car stove that has ever been made could have withstood the shock. It will show the force of the collision, perhaps, to say that one of the holding-down bolts of the steam-heater was broken and the others bent and pulled through the flooring. Two of the 1½ × 3 in. wrought-iron holding-down lugs were bent and cracked. If this does not show the advantage of steam heat, then I don't know what does."

A Saw for Cutting Armor Plate.

A metal saw considerably used in Europe is in use at the Pittsburgh plate mills, according to the *Iron Trade Review*, which depends on teeth for cutting, instead of on the friction of its rapidly moving periphery. The saw is of very fine steel, with a hard temper, about a quarter of an inch thick, ground thinner at its centre to clear in a deep cut. The work is fixed, and the saw is progressed through the work, cutting about 1 in. per minute by the aid of a screw and a hand or self-acting gear. The success of its work is said to depend largely on the cooling solution in which the work is immersed. It is made of 10 lbs. of whale-oil soap, 15 lbs. of sal soda and 2 galls. of the best lard oil, with water enough to make 40 galls. of the mixture.

A Boiler Explosion.

In reporting on the explosion of the boiler of the engine of a goods train which occurred on Nov. 27 at Seaton Station, on the Workington & Seaton branch of the Furness Railway, Major-General Hutchinson says: "This boiler explosion was caused by the upper middle plate having become, through grooving along the longitudinal joint on the left side, too weak to resist the steam pressure at which the engine was being worked. The plate in question met the lower plate with a lap joint and inside landing, and the grooving had taken place along this landing for nearly the whole length of the plate, the greatest depth being about a quarter of an inch. The engine had been stationary—after shunting—for a few minutes before the explosion occurred. The steam pressure at the time is stated to have been about 100 lb. to the square inch, the working pressure being about 120 lb. The boiler is about 20 years old, its mileage amounting to 437,000 miles. It had been last examined internally five years ago, when it had to be retubed, and at this time no signs of grooving are said to have been detected. Old boilers, and particularly those constructed as this was, with lap joints, should certainly be subjected to more frequent internal inspection than the one in question, or, failing this, to a periodical hydraulic test at a pressure exceeding that of the working pressure."

Turnbuckle Litigation.

Suit has been entered in the United States Circuit Court against the Central Iron & Steel Company of Brazil, Indiana, by the Cleveland Forge & Iron Company, of Cleveland, to determine which of these companies has the indisputable right to make the Williams turnbuckle. The history of this matter is about as follows: Williams, the inventor, was a workman at the Cleveland Forge & Iron Company, which offered him a considerable sum of money for his patent. He, however, entered into an agreement with, and gave the right to make the turnbuckle to, the Central Iron & Steel Company of Brazil, with a proviso that that company should put up buildings and machinery of a stipulated kind. After the buildings and machinery were put up and had been put in operation, Williams became dissatisfied, and claimed that the Brazil company had not furnished proper facilities for manufacturing the buckles, and hence, without coming to an agreement, transferred his interest in the business to the Cleveland Forge & Iron Company. The case will come up in May, and the suit is one of great business importance.

The Fluviograph.

At a recent meeting of the Société d'Encouragement, Mr. Ch. Mocquery, Chief Engineer of Bridges and Roads, described what he termed an electric "fluviograph," an instrument designed to register, at any desired distance, by means of electricity, variations in the height of water level of a watercourse, and to give timely warning at sites of dams of impending floods, so as to enable adequate means to be taken to provide for heavy rushes of water.

Briefly described, the device consists of a float about 1 in. in diameter, which rises and falls in a vertical cast-iron tube, the latter being in direct communication with the river whose varying levels are to be recorded. This float transmits its motion to a wheel, whose circumference measures exactly one metre (3.28 ft.), and which gears with another wheel of such proportions that every five centimetres of vertical displacement of the float corresponds to an interval of two teeth on the smaller wheel. A conveniently arranged electric contact thus permits of sending an electric current through a wire at every such displacement, and gives indications of the nature of the variation in the water level. These can be recorded on a chart. Arrangements can also be made for electrically sounding a high-water alarm. The device is said to have been in use on the river Seine since 1882.

The Launch at Chicago.

The "Mariana," the first steel steamship built on Lake Michigan, was launched at Chicago with great enthusiasm on the 14th inst., in the presence of the mayor and a large concourse of spectators, including many school children. The school trustees of South Chicago do not agree with those of Brooklyn on the immorality of ship launching. The keel of the "Mariana" was laid last June, as noticed in the *Railroad Gazette*. It is built of steel rolled in Cleveland, O. The vessel is 308 ft. long, 40 ft. beam and 24 ft. depth of hold, and will carry 3,000 tons of ore. She has triple expansion engines of 1,400 H. P., with two tubular steel boilers. She will be ready for service by the opening of navigation, and will go into the Lake Superior ore trade between Two Harbors, Minn., and South Chicago and Ashtabula. The "Matoa," a sister ship, will be launched in about six weeks, and is destined for the same trade. The Chicago Shipbuilding Co. was organized in December, 1889, and is justly proud of making this first launch within 15 months.

Profit Sharing.

The profit-sharing system adopted by the Ingersoll-Sergeant Rock Drill Co. has worked very successfully. During the past year the company declared an employés' dividend of about $6,000, dividing it as a bonus among the employés of the shops and offices. The sum was larger during the year 1890 than previously, due to the large increase in business.

THE SCRAP HEAP.

Notes.

Fifteen passenger conductors have been dismissed by the Michigan Central.

The locomotive engineers of the Marietta & North Georgia struck last week, but it is stated that their places were soon filled.

The General Manager of the Union Pacific has notified all telegraph operators employed by the company in Colorado that they must sever their connection with the Order of Railway Telegraphers or leave the service of the company at once.

At Pittsburgh last week the arrest of four youths for stealing freight from cars of the Pittsburgh & Western led to the arrest and confession of a conductor who had some time previously been arrested, tried, cleared and reinstated in his position.

In the debate on the estimates in the German Reichstag this week, Count von Moltke advocated the military necessity of a standard of time for all railroads, in place of the five different standards at present in use. He recommended the adoption of the meridian of Stargard, 15° east from Greenwich, as the standard.

The Governor of Missouri has approved the bill requiring every railroad company of 150 miles or more in length in the state, and which was constructed under a charter or franchise from Kansas, to have its general offices for the control, operation and management of such railroad located in Missouri. The penalty for violating the law is forfeiture of charter. The bill is considered purely a local measure to prevent the Missouri, Kansas & Texas from removing its offices from Sedalia, Mo., to Parsons, Kan.

Foreign Notes.

According to St. Petersburg advices it has been definitely concluded to build the Ussuri Railroad in Siberia. Work on the line, which will be about 310 miles long, is to be commenced at an early date.

According to the *Moniteur Industriel*, advices from the Belgian Legation at Teheran, Persia, are to the effect that the Shah is about to conclude an arrangement with the Russian government by which all railroad construction in Persia is to be suppressed for a period of 10 years.

In referring to the recent severe snowstorms in Germany, and the resulting blockades on railroads, the journals make prominent mention of the several types of rotary snow plows used on American lines. Snow plows of this class are practically unknown on German roads, and it is suggested that they might be profitably used.

German papers point out that the severe winter has entailed an appreciable increase in coal consumption on all the railroads. On the Prussian State railroads, for example, the increase above the normal for passenger trains for a period of four weeks amounted to from 20 to 25 tons per locomotive. For freight engines the increase rose to from 30 to 35 tons for a period of 30 days.

The organization of a Belgian line of steamers, to run between the port of Antwerp and China and Japan, is said to be under consideration. According to the *Journal des Transports*, the proposed line is to compete with the steamers of the North German Lloyd, which enter the port of Antwerp on their eastbound trips and there take on board a large proportion of their passengers and freight.

There is said to be considerable feeling in Austria against the Hungarian Minister of Commerce, who is said to have prescribed a number of railroad freight charges highly protective to Hungarian products and correspondingly prejudicial to Austrian merchandise. The Austrian press and the Vienna Chamber of Commerce have called on the government to intervene and put an end to this condition of affairs, which is said to be so detrimental to the interests of Austrian commerce.

From German accounts it would seem that since the Rhenish railroad passed under the control of the Dutch government there has been a wretched state of affairs as regards transportation facilities. Freight, sent from Amsterdam to Haarlem, which should require a running time of not more than 30 minutes, has frequently been delayed for two weeks and longer, and cattle destined for Germany and England have been known to be left for days at way stations until finally claimed personally by the owners. There is said to be a scarcity of cars and engines, and rolling stock from various roads of other countries is said to be retained for making up the deficiency to some extent.

How the Air Ship Goes.

The Illinois air ship made a very successful trip from Mount Carmel to Chicago. It was carried on a way freight.—*Washington Post.*

Applicable in Freight Offices Also.

It frequently happens that a shipper will come in and say: "Send this to so and so; I don't want any receipt." It too often happens that the receiving clerk, who doesn't have any surplus time, will be glad to get out of the filling up of a blank. The large percentage of kickers and people who want goods traced are those who never want a receipt at time of shipment. As a consequence they can't strike the correct date by a week, and the trace clerk is in for a two hours' job. It should be an imperative rule to insist upon shippers taking receipts. The receiving clerk, more than any other man in the office, should be a careful person, with good judgment and be perfectly conversant with the classification. The majority of those who patronize the receiving desk of an express office are transient or exceptional shippers, and for the very reason that they ship so little the receiving clerk should scrutinize the goods offered for shipment.—*Express Gazette.*

Gold Medal for a Postal Clerk.

The gold medal offered by Postmaster General Wanamaker to the railroad postal clerk who should establish the best record for efficiency during the year 1890 in the Second Division, comprising New York, Pennsylvania, New Jersey, Delaware, Maryland and Virginia, was awarded to P. J. McDonnell, of the New York & Washington line. McDonnell, in the competitive examination, maintained an average of 99.31 per cent., distributing 11,743 letters at the rate of 25 a minute. The Postmaster General gave a medal for each of the 11 divisions, and an extra one for the clerk who should beat the whole country in speed.

Railroads in Siam.

The railroad commissioners of Siam have announced that they will shortly give out contracts for work in connection with a railroad to be built from the capital, Bangkok, to the city of Korat. Public works contractors who intend to hand in bids are invited to send to Bangkok competent representatives to examine into the details of the work to be done. The Siamese Commissioner of Public Works will give all necessary information in regard to the undertaking. The projected line will have a total length of about 167 miles, and the work will be divided up into sections of about 50 or 60 miles each. The bids are to comprise all the work and necessary material of construction, with the exception of rails and accessories, telegraph material, rolling stock, machine tools, and station outfits. The time allowed for the work is six to seven years.

Wrecking Lights in Germany.

The idea of an electric light car for wrecking has reached Germany. It has been adopted on the Eisleben-Sangerhausen railroad. A special van has been fitted up with a steam engine, dynamo, elecric lamps, wires and poles. It is also intended to use this portable plant when tunnels are being repaired.

Incidents of European Railroad Travel.

A woman was found murdered in a railroad train at Seville, Spain, March 12. She was a French dressmaker. On the preceding evening a robber entered a first class carriage on a train at Saragossa, and with a knife stabbed the inspector general of telegraphs. The latter overpowered the assassin and threw him from the train. He was captured in a dying condition.

Pneumatic Tube System for a Railroad Station.

Several years ago the telegraph offices of the central freight station at Stettin, Germany, were transferred from the main building to a special building on the other side of 13 lines of track. In order to dispense with messenger service between the two buildings and yet maintain a quick means of communication a pneumatic tube system was introduced and has since been in operation, with satisfactory results. The tube connecting the buildings is of brass, about 1½ in. in diameter and about $\frac{1}{10}$ in. thick. It is placed about 3 in. below the tracks, and where it is above ground is boxed in. The smallest radius of curvature at all turning points is about 32 ft. The main details of the system are illustrated in the *Centralblatt der Bauverwaltung* of Dec. 6, 1890. The illustrations show the arrangement of the two terminal stations, including the bellows for giving the air pressure necessary to force the dispatch box through the tube, the signaling apparatus, etc. The dispatch box consists of a brass tube about 4 in. long and of slightly smaller diameter than the conveying tube. Its front end is closed with a wooden plug, while the rear end has a detachable, cup-shaped, leather cover. During the four years that the system has been in use there has been no stoppage of any kind, and the only repairs necessary have been in connection with the bellows. In winter, during changes of weather, moisture has occasionally been formed in the conveying tube, tending to retard the passage of the dispatch box. Such moisture, however, has been readily removed by forcing sponges through the tube two or three times a day. The system was put in by Messrs. Toepfer & Schaedel, of Berlin, and has more recently been duplicated in the Stettin railroad station at Berlin. Its cost is given as about $325.

Steam Heating.

The Superintendent of the New York division of the New York, New Haven & Hartford has issued this order: "To Passenger Conductors.—An order has been made that no fire be allowed in any heater in baggage cars running on the New York division, and arrangements have been made for the removal of fire from such cars on west-bound trains before leaving New Haven. Instruct your baggage-masters accordingly, and your trainmen that in all other passenger cars the fires shall be kept as low as possible consistent with the comfort of passengers. You are expected to know personally that these rules are enforced."

LOCOMOTIVE BUILDING.

The Kingston Locomotive Works, at Kingston, Ont., are pretty well crowded with orders, which include 10 mogul engines for the Grand Trunk, four engines, weighing 100 tons each, for the Chignecto Railroad, and a number of standard engines.

The Cleveland, Cincinnati, Chicago & St. Louis is preparing specifications for 20 locomotives, for which orders will probably soon be placed. Ten of the number will be passenger engines and 10 will be ten-wheel freight engines.

The West Virginia Central & Pittsburgh has ordered three freight locomotives from the Baldwin Works.

The Housatonic may soon order a few locomotives. The purchase is now under consideration.

The Baldwin Locomotive Works were awarded a contract this week for 40 mogul and eight consolidation locomotives for the Northern Pacific. They are similar to engines of the same classes which have been previously built for the road. The eight consolidations are of the "octopod" class, similar to engine 10,000, which was illustrated in the *Railroad Gazette* of Sep. 27, 1889. They have 22 × 28 in. cylinders, and weigh, in working order, about 150,000 lbs. The first engines of this class for the Northern Pacific were built in 1888, and since that time the works have built 24 engines of this type for that road, or 32 in all with eight now ordered. The orders for them have been continued almost every year since the company began using them.

CAR BUILDING.

The Ohio Falls Car Co. has an order to build 350 freight cars for the Iron Car Equipment Co., 500 for the Louisville Southern and 500 for the Wichita Valley roads.

The Ensign Car Co., of Huntington, W. Va., last week received an order for 200 fifty-ton double hopper gondola coal cars for the Chesapeake & Ohio. All the cars are to be equipped with air brakes and automatic car couplers.

The Buffalo Car Mfg. Co. has secured the contract for 200 gondola cars for the Mahoning Valley. These cars are to be equipped with the Trojan car coupler.

The Long Island road has ordered 28 passenger cars from the Jackson & Sharp Co.

The Barney & Smith Co. has received an order for passenger cars from the Northern Pacific. An order for 1,400 freight cars has been divided between the Peninsular Co. and one other Northwestern firm.

BRIDGE BUILDING.

Centralia, Wash.—The commissioners of Lewis County, Wash., will receive proposals until May 7 for a wagon bridge, with a 190-ft. span, to be built across the Chehalis River.

Galveston, Tex.—Many of the business men of the city have petitioned the County Commissioners to erect the proposed bridge to the mainland, and action will soon be taken by the commissioners.

Jefferson County, Ga.—Seven bridges across the Ogechee River, near Louisville, which were recently destroyed by floods, will be replaced as soon as the necessary appropriations have been approved.

Kenova, W. Va.—The Big Sandy Bridge Co. was organized at Ceredo, Wayne County, W. Va., last week, and will apply to the Secretary of State in a few days for a charter. The company proposes to build a steel highway bridge over the Big Sandy River at Kenova, W. Va., and to begin the work early this spring. The bridge will cost $40,000.

Ottawa, Can.—Plans for a $30,000 bridge across the Rideau River, at Ottawa, have been ordered.

Philadelphia.—The Pennsylvania will soon begin the erection of new overhead bridges over four of the streets in Philadelphia, between Frankford and Holmesburg Junction. The bridges will be over Orthodox, Margaretta, Frankford and Bridge streets, and the work will cost over $180,000. The Board of Highway Supervisors have revised the grades of 23 streets between Frankford and Holmesburg Junction, which will be changed at a cost to the city of $35,000. As soon as these four bridges are erected the Pennsylvania will construct four more, one at Wissonoming Station, Levering street, Washington street, and Township Line or Cottman street.

St. Lawrence River.—The necessary legislation is being secured to construct a railroad and highway bridge across the River St. Lawrence, from a point in St. Lawrence County, N. Y., to the opposite shore on the Canadian side. Messrs. Jones, Griffith, Huntley, Cole and Reynolds are appointed to locate the bridge. The capital stock of the company is $500,000.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In the Federal Court it is held that where Pullman sleeping cars are run wholly within a state, the business may be taxed as a privilege, and that the Tennessee statute providing for the taxation of sleeping cars does not impose a privilege tax for counties upon sleeping cars run wholly within the state, but is confined to one privilege tax for the state.[1]

In Kentucky the Court of Appeals decides that a city whose corporate limits extend to low-water mark on the opposite side of the Ohio River has authority to make an assessment for railroad and school taxes of the district constituted by such city, against a railroad bridge built across the river, where the city granted the land on which the approaches of the bridge are built, reserving as a consideration therefor the right to tax the bridge itself, and all its appurtenances within the corporate limits of the city.[2]

Carriage of Goods and Injuries to Property.

In Arkansas the Supreme Court holds that under the statute providing that a railroad company refusing to deliver freight at its destination upon payment or tender of the charges due by the bill of lading shall be liable to a penalty, the entire charges must be paid or tendered in order to fix the liability, and where a consignee declines to receive a portion of the goods because they are damaged, and the company refuses to deliver the undamaged freight upon a tender of its proportion of the charges, and it is thereupon replenived, and subsequently, after repairing the damage, the company refuses to deliver the remaining goods upon a tender of their proportion of the charges, but offers to do so upon the payment of the whole bill, no liability for the penalty is incurred.[3]

In Arkansas the Supreme Court holds that a shipper to whom a railroad company falsely represented that the rate charged him was the through rate agreed upon by the connecting lines, cannot recover the difference between the rate agreed on by the companies and that charged him, on the ground that the false representations and the payment of the higher rate constitute extortion.[4]

In Georgia the Supreme Court rules that a carrier is not liable for injury occurring without its negligence or fault to goods held by it for payment of freights advanced to connecting lines.[5]

In Tennessee it is held by the Supreme Court that the construction along a city street, to a point five miles in the country, of a railroad whose cars are propelled by a "dummy" steam engine, and whose trains carry passengers only, and stop at all street crossings, is an additional servitude upon the street, for which the owner of the fee is entitled to compensation. The fact that a railroad is constructed along a city street under a charter from the state, and a contract with the city and county, does not deprive the owner of the fee of his right to compensation therefor.[6]

In the United States Supreme Court it is stated that where Congress grants a right of way to a railroad company over streets, the title to which is in the United States, or where a city grants such right of way, when the title is in it, the company takes the grant subject to a liability to abutting property owners for any damages to their property by reason of its building the road.[7]

In New Jersey it is laid down that the owner of land taken for railroad purposes may show the special availability of the land as a railroad approach to an established centre of commerce.[8]

In the United States Supreme Court it is held that the constitutional provision that private property shall not be taken "for public use without just compensation" does not require that compensation shall be actually paid in advance of the occupancy of the land to be taken. It only requires adequate provision to be made for the owner's obtaining compensation.[9]

Injuries to Passengers, Employes and Strangers.

In New York in an action against an elevated railroad company for the wrongful death of a painter who was engaged in painting the superstructure when struck by a passenger train and killed, it appeared that the deceased was in the employ of a company which did the painting, and that he could see an approaching train from where he was at work, and that he was not seen by the engineer or any one on the train. The Supreme Court holds that there could be no recovery.[10]

The Georgia code provides that railroad companies shall be liable for damage done "by" any person in their employment and service. The Supreme Court rules that it was error to charge that the company was liable for damage done "to" any person in its employment.[11]

In Arkansas it is held that a railroad is liable for injuries sustained by a yardmaster coupling cars, which resulted from the defective condition of a set of platform scales, over which its trains are accustomed to pass, though owned by and built upon the land of a coal company.[12]

In Missouri the deceased was a brakeman on a freight train. It was shown that he turned a switch to allow the engine to go on a side track to take out some box cars; that he then got on the brake beam of the tender, and the engine backed on down toward the cars, which were about 700 feet down the track, and could be seen from the engine by the gleam of lamps at the depot; that when about midway the tender struck a flat car loaded with rails, which projected some distance over the end of the car, so that they caught deceased between them and the tender, causing his death. The flat car was so low that it could not be seen from the tender in moving toward it, and deceased did not know it was on the track. The Supreme Court holds that defendant was not liable for the accident, since it was attributable either to the negligence of co-employés or the ordinary risks of the service.[13]

An Alabama statute requires locomotive engineers operating engines "on the main line of road of any railroad" to be licensed. The Supreme Court holds that in a suit by a brakeman for an injury caused by the alleged negligence of an engineer who had no license, it was error to charge that he was required to have a license, and that the want of one tended to show the company's negligence, when the accident occurred in a freight yard, in the use of a yard engine, and the engineer was employed only for yard work.[14]

In New York a conductor was hurt by a collision between his train and a fugitive freight car. That car and another were on a side track. The train was made up on another siding, and, as it was leaving the yard, the two cars ran down and struck the caboose. What started them does not appear. The brakes were out of order; but the yardmen had put the cars on the siding without setting, or attempting to set, the brakes, or blocking the wheels. The rules required them to do one or the other. The Supreme Court decides that the failure to set the brakes or block the wheels was the neglect of fellow-servants; that there is no evidence that the defect in the brakes contributed to the collision, and that a verdict for the conductor was properly set aside.[15]

In Missouri it is ruled by the Supreme Court that where city ordinances prescribe certain precautions to be observed by railroad companies at public crossings, they do not relieve the companies from the observance of ordinary care in particulars not mentioned in the ordinances.[16]

In Texas, in an action by a child five years old, for personal injuries sustained while playing on defendant's turn-table, which was unguarded and unfastened, it appeared that some of the plaintiff's playmates were over 14 years old, but it was not shown by which one the table was revolved when it crushed plaintiff, who was just climbing on it. The Supreme Court rules that defendant was liable for its negligence in allowing the turntable to remain unguarded and unfastened, though the negligence of a responsible person in turning the table may have contributed to the accident.[17]

In the Federal Court it is held that a railroad has a right to run its trains at any speed deemed proper when they are not passing through an incorporated city or town, or crossing a public street or highway; and the engineer, in such case, is not bound to look out for persons on the track.[18]

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[1] Gibson County v. Pullman South. Car Co., 42 Fed. Rep., 572.
[2] Henderson Bridge Co. v. City of Henderson, 14 S. W. Rep., 85.
[3] St. Louis, A. & T. Ry. Co. v Johnson, 13 S. W. 1,096.
[4] Arkansas & L. Ry. Co. v. Smith, 13 S. W. Rep., 929.
[5] Georgia R. C. v. Murray, 11 S. E. Rep., 779.
[6] East End St. Ry. Co. v. Doyle, 13 S. W. Rep., 936.
[7] Hot Springs R. Co. v. Williamson, 10 S. C. Rep., 955.
[8] Curry v. Waverly & N. Y. B. R. Co., 20 Atl. Rep., 56.
[9] Cherokee Nation v. Southern Kan. Ry. Co., 10 S. Ct. Rep., 965.
[10] Pallett v. Kings County El. Ry. Co., 10 N. Y. Supp., 691.
[11] Western & A. R. Co. v. Vandiver, 11 S. E. Rep., 781
[12] Little Rock & Ft. S. Ry. Co. v. Cagle, 14 S. W. Rep., 89.
[13] Jackson v. Missouri Pac. Ry. Co., Mo., 14 S. W., 54.
[14] Memphis & C. Ry. Co. v. Askew (Ala.), 7 South Rep., 823.
[15] Harvey v N. Y. C. & H. R. R. Co., 10 N. Y. S., 615.
[16] Wilkins v. St. Louis, I. M. & S. Ry. Co., 13 S. W. Rep., 893.
[17] Gulf, C. & S. F. Ry. Co. v. McWhirter, 14 S. W. Rep., 26.
[18] Farve v. Louisville & N. R. Co., 42 Fed. Rep., 441.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago, Milwaukee & St. Paul, $3.50 per share, payable April 16.

Rome, Watertown & Ogdensburg, a special dividend of 20 per cent. has been declared, payable in new stock, to stockholders of record, March 21.

Southwest Pennsylvania, 5 per cent., payable March 31.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Allegheny Valley, annual, Pittsburgh, Pa., April 14.

Central New England & Western, special, Room 37, 115 Broadway, New York City, March 23.

Central Ohio, annual, Columbus, O., April 29.

Chesapeake, Ohio & Southwestern, annual, 56 East Court street, Memphis, Tenn., April 6.

Chicago & Alton, annual, Chicago, Ill., April 6.

Chicago & Grand Trunk, annual, Rialto Building, Chicago, Ill., April 8.

Chicago, St. Louis & Pittsburgh, annual, Indianapolis, Ind., April 15.

Chicago & West Michigan, annual, Muskegon, Mich., April 15.

Cincinnati, Lebanon & Northern, annual, Cincinnati, O., April 14.

Cincinnati & Muskingum Valley, annual, Zanesville, O., March 24.

Cincinnati, Richmond & Fort Wayne, annual, Richmond, Va., April 7.

Fort Worth & Rio Grande, annual, Forth Worth, Tex., April 7.

Joliet & Chicago, annual, Chicago, Ill., April 6.

Kensington & Tacony, annual, 233 South Fourth street, Philadelphia, Pa., March 24.

International & Great Northern, annual, Palestine, Tex., April 6.

Little Rock & Fort Smith, annual, Little Rock, Ark., April 30.

Long Island, annual, Long Island City, N. Y., April 14.

Mexican National, annual, Colorado Springs, Col., April 6.

Morgan's Louisiana & Texas, annual, New Orleans, La., April 6.

Morristown & Cumberland Gap, special, Morristown, Tenn., April 9, to act upon a proposed increase of capital stock.

New York & Long Island, special, 22 State street, New York City, April 15, to authorize an increase of the capital stock.

Norfolk & Ocean View Railroad & Hotel Co., annual, 31 Bank street, Norfolk, Va., March 23.

Oswego & Rome, special, 96 Broadway, New York City, March 28.

Panama, annual, Mills Building, New York City, April 6.

Pittsburgh, Cincinnati, Chicago & St. Louis, annual, 1003 Penn avenue, Pittsburgh, Pa., April 14.

River Front, annual, 233 South Fourth street, Philadelphia, Pa., March 24.

St. Louis Southwestern (Missouri), special, Room 14, Equitable Building, St. Louis, Mo., April 21.

St. Louis Southwestern of Texas, special, Tyler, Tex., April 15.

Tennessee Coal, Iron & Railroad Co., bienniai, Tracy City, Grundy County, Tenn., April 7.

Unadilla Valley, special, 80 Broadway, New York City, April 15.

West Virginia Central, annual, 1727 North 10th street, Philadelphia, Pa., March 26.

West Virginia & Pittsburgh, special, Weston, W. Va., March 25.

Wheeling & Lake Erie, special, Toledo, O., April 15, to vote on a proposed increase of the capital stock.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, in the Gilsey House, New York City, at 2 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union Station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1 122 Girard street, Philadelphia, on the first and third Saturday, of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursdays at 8:00 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month, at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

American Society of Civil Engineers.

The annual convention will be held at Lookout Mountain, Tenn., beginning about May 20, 1891. A concise abstract of any paper to be presented should be sent to the Secretary not later than April 20. This will make discussion more probable, as a copy of the abstracts will be sent to members who may be expected to contribute discussion.

The Secretary announces the result of the ballot on the revised constitution as follows:

On the first eleven pages marked (A) there were cast: For the amendment, 289 votes; against, 35; total votes cast, 324. Necessary for adoption, 216 votes, hence the Constitution was adopted. On the Article on Local Association marked (B) there were cast: For the amend-

ment, 182 votes; against, 139; total votes cast, 321. Necessary for adoption, 214, hence this amendment was lost.

The American Society of Civil Engineers proposes to notice (not review) in the *Transactions* books on engineering and allied sciences. The Secretary therefore requests that publishers will send copies of their scientific publications to him, 127 East Twenty-third street, New York, and that the price in all instances should be named, as a matter of useful information.

Civil Engineers' Club of Cleveland.

The 11th annual meeting was held at the Club Rooms Tuesday evening, March 10, 37 members and five visitors present. A brief memoir of Mr. Joseph M. Blackburn, member of the club lately deceased, was presented, and resolutions of respect adopted.

Ballots for the election of officers for the ensuing year were canvassed and the following declared elected: President, Jos. Leon Gobeille; Vice President, M. E. Rawson; Secretary, A. H. Porter; Treasurer, N. P. Bowler; Librarian, C. M. Barber; First Director, F. C. Osborn, and Second Director, S. J. Baker.

A revised constitution was adopted. The retiring officers presented their annual reports. The President's report was admirable, and showed that the interest in the club was increasing, as well as the membership. The secretary's report showed a total membership of 157, a gain of 20 during the past year. There were two deaths and only one resignation during the year. Thirteen papers were read before the club and there was one other discussion upon a technical subject. The treasurer's report showed the finances of the club to be in a satisfactory condition. The librarian's report showed the urgent necessity for more room and better accommodations for the engineering library that is constantly growing.

The chairmen of the various committees on programme made brief reports upon the progress of the different branches of engineering during the year. Three of these reports were especially interesting—that of Prof. C. L. Saunders on Surveying and Civil Engineering, that of Mr. Walter Miller on Mechanical Engineering, and that of Prof. C. S. Howe on Some Recent Discoveries in Astronomy.

The various committees on programme for the ensuing year were appointed. A vote of thanks was extended to the retiring officers.

Engineering Association of the South.

The regular monthly meeting of the association was held at Nashville, Tenn., March 12, with President John B. Atkinson, of Earlington, Ky., in the chair and about 20 members and visitors present. An application for membership was received from Mr. W. W. Perry, Assistant Engineer for the Maplewood Home Co.

President Atkinson announced the appointments for the standing Committee on Highways ordered at the last meeting of the association. The committee is to comprise one member from each state represented in the association.

A paper on "Mine Inspection," read by Mr. C. J. Norwood, Kentucky State Inspector of Mines, of Frankfort, Ky., presented a very complete exhibit of the present status of the 91 coal mines in Kentucky, which are subject to state inspection. Mine inspection was first introduced into Kentucky in 1884, the law at first, however, being quite imperfect. At present ventilation by natural means is prohibited; fans are used at 16 of the mines and ventilating furnaces at the remainder, and 100 cu. ft. of air per minute per man is required to be delivered in each section of every mine in the state. Headings and entries are not allowed to be opened more than 60 ft. in advance of air. The mine law requires safety catches to be maintained on all cages and imposes a fine of five dollars per day per cage for failure to comply with the law. Fire damp has been found in only ten mines in the state and explosions resulting therefrom in only two of these.

President Atkinson extended an invitation to the association to hold its May meeting at Earlington, Ky., which is in the heart of the western coalfield, and the invitation was accepted.

New England Railroad Club.

The annual meeting was held Wednesday evening, March 11, President Richards in the chair. The report of the Secretary and Treasurer was read by Mr. F. M. Curtis and was accepted. The nominating committee appointed at the last meeting reported the following list of names as officers for the ensuing year: President, F. M. Twombly; Vice-President, John T. Chamberlain; Secretary and Treasurer, F. M. Curtis; Executive Committee, F. M. Twombly, F. D. Adams, J. N. Lauder, J. W. Marden, L. M. Butler, John Coughlan, George Richards, John T. Chamberlain and E. E. Davis; Finance Committee, John Kent, A. J. Barber, Daniel S. Page, George B. Sweet, Henry L. Leach, Joel H. Hills, Osgood Bradley, and George H. Wightman. These gentlemen were duly elected.

The President announced as the subject for discussion at the April meeting of the club, "Air Brakes for Freight Trains, their Care, Condition and Efficiency." The subject is to be opened by Mr. Angus Sinclair, Secretary of the Master Mechanics' Association.

PERSONAL.

—Maj. E. L. Tyler, General Manager of the Atlantic & West Point road, was this week elected President of the Atlanta & Florida, in place of Mr. Robert Maddox, resigned.

—Mr. W. J. Murphy, formerly General Superintendent of the New York, Lake Erie & Western, has been appointed Superintendent of the western part of the present Georgia Division, which has been divided.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—George B. Hazlehurst, previously Acting General Superintendent of Motive Power, has been appointed General Superintendent of Motive Power of this company, with headquarters at Baltimore, Md.

Barre.—F. E. Dodge has been appointed Road Master, with headquarters at Barre, Vt., vice C. L. Dolloff, reigned.

Breckenridge.—D. Stewart Miller has been elected President of this company, with office at Louisville, Ky. James Heron has been appointed General Passenger and Freight Agent in place of Alexander Inglis.

Clarendon, Oklahoma & St. Louis.—At a recent meeting of the stockholders at Clarendon, Tex., the following directors were elected: I. W. Carhart, J. D. Stocking, B. H. White, D. W. Van Horn, W. L. Sage, F. V. Evans, L. C. Beverly. The directors elected the following officers: I. W. Carhart, President; J. D. Stocking, Vice President; D. W. Van Horn, Treasurer; W. L. Sage, Secretary.

Dubuque & Sioux City.—The annual meeting of the company was held in Dubuque, Ia., March 16. E. H. Harriman was elected President, J. C. Welling, Vice-President; Henry D. Wolf, Treasurer; H. E. Hackstopf, Secretary; C. A. Beck, General Manager.

Duluth, Red Wing & Southern.—C. Sheldon has been appointed Superintendent, vice H. B. Briggs, resigned. Mr. Sheldon will also have charge of the traffic department of the company.

Galveston & Western.—The stockholders have elected the following directors for the year: Walter Gresham, W. L. Moody, Julius Runge, D. B. Henderson, J. E. Wallis, George Seeligson, A. M. Shannon, H. M. Trueheart and T. C. Thompson. The Directors selected the following officers: President, Walter Gresham; Vice-President, J. E. Wallis; Secretary, William Selkirk; Treasurer, W. L. Moody.

Jackson, Lansing & Saginaw.—The directors met in Jackson, Mich., last week and re-elected the following officers: President, H. A. Hayden; Secretary, O. M. Barnes, Lansing; Treasurer, W. D. Thompson.

Lehigh & Hudson River.—P. W. Barrett has been appointed Superintendent of Track, Buildings and Bridges, with office at Warwick, N. Y.

Mexican National.—Thomas Milan has been appointed Superintendent of motive power and machinery. The headquarters of superintendent of motive power and machinery will be at San Luis Potosi, Mexico, until otherwise ordered. J. L. Williams has been appointed Superintendent of the San Luis Division, vice Thomas Milan, promoted.

Montgomery Belt.—The annual meeting was held at Montgomery, Ala., last week, when R. C. Fauss, Jr., was elected a director to fill a vacancy caused by the death of John C. Woolfolk. Hon. S. G. McLendon, of Thomasville, Ga., was also elected a director, Mr. Tilley, of New York, having resigned.

Northern Pacific.—Joseph J. Hall has been appointed Assistant Superintendent of the Manitoba Division, with headquarters at East Grand Forks. This office has just been created. Mr. Hall was formally a conductor on the Minnesota Division.

Northwestern Ohio.—The annual meeting of the stockholders of the company was held at Toledo, O., March 13. The following were elected directors: Thomas D. Merster, James McCrea, R. F. Smith, G. W. Layng, Frank Janes, John W. Rinner, and Joseph Wood. The same directors were elected for the Tiffin & Northwestern.

Orange Belt.—At the annual meeting of the stockholders, in Oakland, Fla., March 9, the following directors and officers were elected: Directors, E. T. Statesbury, F. V. Dare, T. E. Wilson, William Macleod and L. Y. Jenness; President, E. T. Statesbury; Vice-President and General Manager, William Macleod; Treasurer, G. A. Hill; Secretary, Hugh H. Richardson.

St. Catharines & Niagara Central.—The following directors were elected at a meeting in St. Catharines, Ont., last week: Lucius S. Oille, President; Sylvester Neelon, Vice-President; John Shields, Edward A. Smyth, William W. Greenwood, F. W. Fearman and Henry A. King.

Southern Pacific.—L. R. Fields, previously Acting Superintendent, has been appointed Superintendent of the lines of this company in Oregon, with headquarters at Portland, Or.

Texas & Pacific.—The annual meeting of the company was held in New York March 18. The following board of directors was elected: Jay Gould, C. M. McGhee, John T. Terry, Isaac J. Wiston, Milton H. Smith, Russell Sage, George J. Gould, A. L. Hopkins, J. N. Hutchinson, E. B. Wheelock, Sidney Dillon, Samuel Sloan, Samuel Thomas, John A. Grant, S. H. H. Clark, C. E. Satterlee and Thomas T. Eckert. The only new directors are Mr. Dillon and Mr. Grant, who fill vacancies. The next annual meeting will be held in Dallas, Tex., to conform to the state laws.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Akron & Chicago Junction.—The track on this extension of the Baltimore & Ohio is being laid through Summit and Wayne counties by tracklaying machines, and the work is now progressing between Creston and Sterling to a point a few miles beyond the latter town. Thirty miles of the track was laid last year from Akron, but the work has been delayed during the winter on account of the unfavorable weather. The road extends from Akron south through New Portage and Clinton, and thence westerly through Lodi to Chicago Junction, O., 69 miles from the eastern terminus.

Baltimore Belt.—The excavations for the tunnel through Baltimore, Md., have been delayed through quicksand found on the lower levels of the work. The contractors now have about finished one-fifth of the work on the tunnel or open cut. The first shaft was sunk early last September, and the excavation for the cut will probably be all done in 18 months. The union station to be built by the company will be erected on Lombard street, between Liberty and Howard streets, two blocks north of the Baltimore & Ohio station. The new station will be used by the Baltimore & Ohio, and it is stated that the plans have been finished by the engineers, and that they have been accepted by the latter company and by the Belt Line.

Baltimore & Ohio.—The grading and the other construction work on the extension of the Fayette County branch from Uniontown, Pa., southwest to Morgantown, W. Va., on the main line to Wheeling, was suspended last week. It is not known whether the suspension is a temporary one or whether the company has entirely abandoned the idea of building the line. It is about 20 miles long and most of the grading has been completed.

Bellingham Bay & British Columbia.—The track on the main line of this road was laid to Sumas City, Wash., early this month, and connection will soon be made with the extension of the Canadian Pacific near the junction with the Seattle, Lake Shore & Eastern. Trains will probably begin running from Whatcom, on Bellingham Bay, to the international boundary line in a few weeks.

Calgary & Edmonton.—The contractors state that work will be resumed on this road as soon as the frost is out of the ground, and that the line will be completed to Edmonton, in Alberta, early in July. When that line is completed work will be commenced on the section from Calgary south to McLeod, which will be ready for operation, according to present calculations, next fall.

Camden County.—The first trip over the new road was made last week. The branch extends from Mount Ephraim to Glenloch, N. J., formerly Spring Mills, and is a branch of the Atlantic City road (Reading system). It runs from the Camden, Gloucester & Mount Ephraim Railroad terminus. The new line is about seven miles long, and touches Blackwood, Bell Mawr, Runnymede, Glendora, South Glendora, Hill Top, Blenheim and Mechanicsville.

Cartersville & Gainesville.—Parker N. Black, of Atlanta, Ga., has recently made a reconnoissance for a proposed road from Cartersville through Canton, Tate and Dawsonville to Gainesville, Ga. The distance to Dawsonville is 46 miles, and all but three miles of the grading between that town and Gainsville is finished, having been built by an old company. The track is laid from the Chestatee River to Gainesville, and a bridge across the Chattahoochee River built. The total length of the line will be about 73 miles. There will be four large bridges, across Etowah River northwest of Emerson and west of Canton, at the Amicolola River west of Dawsonville and at the Chestatee River. Four small bridges will have to be built.

Chesapeake & Ohio.—The branch from Eagle Rock to Newcastle, Va., will probably be placed in operation in a few weeks. It begins on the James River division and follows Craig's Creek to Newcastle, a distance of about 25 miles. The branch is through a rich mineral country, and furnaces are already being erected.

Chicago & Evansville.—The route of this road between Henderson and Bowling Green, Ky., a distance of 100 miles, was finally located by the survey recently made, and which, as stated recently, has been adopted by the directors. The route is through the towns of Delaware, Calboun, Hartford, Beaver Dam, Cromwell and Morgantown. The maximum grade is one per cent. and the maximum curvature four degrees. The work is moderately heavy, but not difficult. Two bridges to be built across Green River will be 400 ft. each; one across Rough River 150 ft., and one across Gasper River 150 ft. Following the survey, 75 miles of the right of way was donated. Since the surveys were resumed early in the year, many of the towns which had already voted bonds in aid of the road have largely increased their subsidies.

Choctaw Coal & Railway Co.—The company is reported to be pushing the grading on the section of its Western Division, between Oklahoma City, on the Atchison, Topeka & Santa Fe, and El Reno, on the Chicago, Rock Island & Pacific. Part of the track has been laid, and the construction trains are carrying tracklaying material from El Reno. Only a few of the trestles and bridges have been erected.

Cincinnati, Dayton & Ironton.—A charter was granted to this company in Ohio last week. This is a reorganization of the Dayton, Fort Wayne & Chicago, which was sold under foreclosure proceedings on Feb. 5. The capital stock of the new company is $5,000,000. The incorporators and first board of directors are: E. Jacob, Charles Shannon, John E. Gimperling, W. C. Andrews, E. C. Porter, H. C. Snyder and E. D. Archer.

Great Northern.—The contract for 15 miles of the Pacific extension, commencing at the crossing of Pack river, in Kootenai County, Idaho, and extending westward, was let last week by E. L. Weeks & Co. to Campbell & Brown, of Sand Point, Idaho. The contract also includes laying 250,000 ties. The contractors begin work this week, and the contract is to be completed by July 1.

A survey for the extension as far West as Spokane Falls, Wash., has been filed in the state land offices. It shows the route leaving the main line at Fort Assinaboine, Mont., extending westerly through the Kootenai country to a point on the east fork of the Little Spokane River, near its source; up that river on the north bank on unsurveyed land to the northeast corner of section 25, township 29 north, range 43 east, Willamette meridian, a distance of 20 miles. It then crosses the north half of section 25 to the junction of the west fork of the Little Spokane River, about 25 miles north of Spokane Falls.

Hamilton & Barton Incline.—The projectors of this company have applied for a charter for a line on Chedoke street, in Hamilton, Ont. The intention is to construct the line through the township of Barton and Glanford, the cars to be propelled by steam or electricity. Both freight and passengers will be carried.

Herkimer, Newport & Portland.—John B. Westbrook, 22 William Street, New York City, was awarded the contract this week for 117 miles of the proposed extension of this road from Poland, the present terminus north through Alder's Creek and Hawkinsville, and thence northwest to the South Branch of the Moose River.

Huntington Belt.—Tracklaying on this belt street railroad at Huntington, W. Va., was commenced last week. The road is to be completed and cars running May 1.

Louisville & Nashville.—A branch of this road from Big Stone Gap, Va., which is to be about 4½ miles long, is to be built by a Mr. Scruggs, of Lynchburg, Va., who was recently awarded the contract.

McKeesport & Bessemer.—Work is about finished on this line, which is being built from a point on the Monongahela River division of the Pennsylvania, across the Monongahela River and south through McKeesport, Pa., reaching the works of the Monongahela Furnace Co., the National Tube Works and the other factories at McKeesport. The line is a branch of the Pennsylvania and is about five miles long. The contractors for the entire work are Drake & Stratton, of Pittsburgh. The principal work now in progress is on the piers and superstructure for the bridge across the Monongahela River.

Memphis, Rogers & Western.—The company has applied for a charter in Arkansas to build a road from Rogers to Bald Knob, following a route between the Kansas City, Springfield & Memphis and the Arkansas Valley road. The road is to be continued to intersect the new road to Fort Gibson. The capital stock is $1,000,000, of which $600,000 is reported subscribed. The survey is to be made at once.

Mexican Northern.—This road is now being operated from Escalon, on the Mexican Central, to within 35 miles of its proposed terminus at Sierra Mojada. The track has been laid for about 70 miles, and the recently completed section of 20 miles will soon be in operation. Probably the entire line will be opened early in April.

Mobile & Girard.—The contractors on the extension from Troy, Ala., south have recently commenced tracklaying, and that work is now progressing quite fairly. The grading has been finished on about half the extension between Troy and Andalusia, Ala., a distance of 51 miles. This work has been done on irregular sections on different parts of the line. A large force of men and teams is now working on the grading and bridging on the unfinished portions. The terminus of the line for the present will be a point in Covington County, on the Escambia River, opposite Andalusia. Worthington, Elliott & Debardeleben, of Birmingham, Ala., and R. C. Strother, of Troy, Ala., are the chief contractors. The extension is built through dense timber lands, and the work is generally heavier than the average for southern pine country. The maximum curvature is five degrees and the maximum grade is 1¼ per cent. The principal trestle is one 4,000 ft. long, built across the Conecuh River swamp. The principal bridge is one over the Patsaliga River, which is about 125 ft. long.

New Roads.—A contract has been let to a firm of Greensburg, Pa., for the grading on a short road from South Fork, near Johnstown, Pa., easterly to the Alleghany Mountains. The grading will be commenced immediately, and the work is to be completed in three months.

H. J. Hampson, of the City of Mexico, has the contract for the grading on a road from San Luis Potosi, Mexico, to a point about three miles from that city, where a smelter is being erected by the Mexican Metallurgical Co.

The Ohio Legislature has passed a law authorizing the County Commissioners of Guernsey County to issue bonds for the purpose of aiding the construction of a road from Lore City, in that county, in a northeasterly direction, through Guernsey and Harrison counties to the Cleveland, Lorain & Wheeling road at Freeport.

W. C. Tilton, of Murray County, Ga., and others are interested in a proposed road to extend from a point in Whitfield County, connecting with the East Tennessee, Virginia & Georgia Railroad, to Ball Ground, in Cherokee County, a distance of about 40 miles. The surveys may be continued to Gainesville. This road will traverse the mineral sections of Murray and Cherokee counties to Ball Ground, where it will intersect the Knoxville Southern.

The Commercial Club of Dallas, Tex., says, in resolutions recently adopted: "We must build a railroad to navigable waters to be operated in the interests of Dallas. We propose then that Dallas, with the aid of the people along the proposed line, construct a road from Dallas to Alexandria, La., a distance of 275 miles, and from Dallas to a point in Young County, Tex., a distance of 125 miles, making an aggregate of 400 miles. We know this road can be built, and partially, if not fully equipped, for $12,500 per mile, or $5,000,000." The club proposes that a six per cent. first mortgage at the rate of $12,000 per mile be issued, and a second mortgage six per cent. bond, at the rate of $8,000 per mile, be issued, "one-half of this issue, or $4,000 per mile, to be taken by the citizens of Dallas, and the people along the line of the road, at 75 cents, or $3,000." This report was signed by John M. Simpson, A. Sanger, J. L. Armstrong, E. P. Cowan, and others.

Norfolk & Western.—Several surveying parties have been running lines for some months on the Virginia side of the Potomac River for the proposed extension to Washington, D. C. The work has progressed with increased vigor since the formal acquisition of the Shenandoah Valley road until last week, when the surveyors were ordered to suspend all work. The surveys for the extension have generally started from Front Royal, Va., a station on the Shenandoah Valley division, south of Riverton, running easterly. The distance to Washington is about 60 miles.

North Carolina Roads.—Bills have been introduced or have passed the state legislature incorporating the following railroad companies: Deep River & McLenan, a line from Gulf to Big Oak, N. C., James McIver, L. Grimm, A. H. McNeil and others, incorporators; Southeastern North Carolina, E. C. Smith, G. H. Snow and Gustave Rosenthal, of Raleigh, N. C., incorporators; Cabarrus & Union, road from Concord to Monroe; North Carolina, Cleveland, Chattanooga & Dayton, A. A. Campbell of Murphy, N. C., and others incorporators; Asheville & Bristol; Blue Ridge; Carolina, Jonesville & Northern; Granite City & Western Short Line; North Carolina, Seaboard & Western; Hendersonville & Brevard; Plymouth, Washington & Greenville; Asheville & Weaverville; Concord Southern; Norfolk, Wilmington & Charleston; Norwood & Rockingham; Wilson & Carolina; Edgecombe & Greenville; Pamlico, Oriental & Western; Johnston City & Greensboro; (Farmers'); Piedmont Springs; Norfolk & Hertford; Asheville, Cranberry & Pulaski City; Georgetown & Charlotte; Atlantic & Western; Asheville & Thermal Belt; Carolina & Virginia; Wilmington & Southern; Marion Belt; Durham Belt; Biltmore & Asheville, and the Danville & Eastern.

Northern Pacific.—The following is the substance of a press dispatch published last week: A party of engineers aking a permanent location for the proposed new extension of the Central Washington from Coulee City west to Waterville, Wash., and it is expected that the branch will be in readiness for operation to the latter point by the time that next season's crop is harvested. From Waterville west to Wenatchee is only 25 miles. Surveying parties have also been sent out to locate a route from the head of Moses Coulee to the Okanogan mines. A line has been surveyed up the Columbia River, but it proves to be somewhat more difficult than was expected, and the exact route is not yet determined. Another extension contemplated is a line from Lewiston to Camas Prairie.

Ontario, Belmont & Northern.—The application of J. M. Ashley, Jr., of New York, and others, to the Ontario legislature for a charter for this company was noted last week. The route is from a point on the Central Ontario, in the township of Marmora, Ont., extending through Marmora, Belmont and Seymour to connect with the Ontario & Quebec and the Grand Junction roads, with right to continue through the Algoma district.

Penobscot Central.—The location of the line through Penobscot County, Me., has been filed in the County Clerk's office. The surveys begin at Bangor and extend through to Piscataquis County by way of Six Mile Falls, Glenburn, Kenduskeag, Corinth, Charleston and Bradford, and from the latter town to Milo. A special meeting of the incorporators will be held at Kenduskeag soon to determine whether the company will vote to increase the capital stock and on the lease to the Castine Navigation Co., which proposes to build from Castine to Bangor.

Port Townsend Southern.—Smith & Johnson, the contractors for completing the grading on the northern section from Hookers Lake south to Quilcine, Wash., on Hoods Canal, eight miles, has about 200 men employed, and is increasing his force. The line will be ready for operation from Port Townsend as far as Hoods Canal in about a month. The ballasting is in progress on the 20 miles between Port Townsend and Hookers Lake. Trains have been running on this section since December.

Reynoldsville & Falls Creek.—No surveys have yet been made for the reported extension from Reynoldsville to Adrian, Pa., and the mines in that vicinity, and the company at present has no idea of building the line, as has been stated.

Rio Grande Western.—H. T. Reynolds, of Springfield, Utah, the contractor for the Sevier Valley narrow gauge extension, has resumed the grading on the line south from the present terminus to Salina, a distance of 26 miles.

Roanoke & Southern.—The contract of Breen & Feely has been transferred to W. E. Waugh & Co. and Pedigo & Marshall. This is for some of the sections on the line between Martinsville and Roanoke, Va.

San Antonia & Aransas Pass.—The uncompleted section of the Waco branch is to be built this summer, and arrangements are being made to resume the work in a few days. The northern section of the line is built from Waco south to Lott, Tex., 28 miles. From this point south to Cameron, on the Gulf, Colorado & Santa Fé, about 23 miles, the construction work could probably be completed for trains in a month. The material for this section has been purchased and delivered. About 30 miles south of Cameron, through Rockdale to a point in Milam County, is also uncompleted. The southern division is in operation to a point north of Lockhart.

Sault Ste. Marie & Southwestern.—It is stated that the control of this road has been sold to the Chicago, St. Paul, Minneapolis & Omaha, and that road will take possession on April 1, and operate the line from Fairchild to Mondovi, Wis., 37 miles. The road extends through an excellent timber country, and a further extension toward the Mississippi has been completed, and it is understood that the Omaha road will continue this extension.

Seattle, Lake Shore & Eastern.—The track of the northern extension was laid to Sumas City, Wash., half a mile south of the international boundary on March 6, and the end of the track has since been extended to the international boundary. About eight miles of track is yet to be laid on the branch being built by the Canadian Pacific from Mission, B. C., south to meet the extension of this road. Some bridging is yet to be done, and the ballasting will take several weeks to finish. This work will be postponed as the snow still lies very deep on the ground. The branch of the Canadian Pacific from Mission is expected to be finished early in April, and both the new lines will be ready to operate soon after that.

Sidney & Southwestern.—The company has been incorporated in Washington to build a road from a point opposite Tacoma northerly to Sidney, near the coast. The capital stock will be $1,000,000, and a system of boat lines will be operated on Puget Sound in connection with the road.

Southern Pacific.—The following is the present status of work on the proposed extensions of the Oregon lines: As to the extension of the Woodburn-Coburg branch from Silverton to Portland, nothing has yet been decided. Some 2,500 tons of steel rails are on hand, sufficient to lay about 28 miles of road. Nothing has yet been definitely decided with reference to the right-of-way between Portland and Silverton. Ties are now on hand for the extension from Corvallis to Junction City. The right of way is practically secured. The intention to build this road has not been abandoned, though nothing definite is fixed as to a date for commencing the work. The grading has been completed on the extension from Coburg to Springfield, and the bridge over the McKenzie is in position. When good weather sets in the track will be laid, and trains will then run from Springfield to Woodburn.

Suburban.—The railroad committee of the Massachusetts legislature gave hearings last week on the petition of this company for incorporation. The proposed road is to extend from Cook street, Newton, on the Woonsocket division of the New York & New England, east about seven miles through Brookline and Mount Bowdoin to the Harvard street station on the main line of the New England road entering Boston. The capital stock is $750,000, and of this about $250,000 has been subscribed. If the road is built it will doubtless be leased to the New York & New England, and that company has already practically agreed to operate it. It will probably guarantee the five per cent. bonds of the new company, which will be issued to the amount of $750,000. The trains of the Woonsocket division of the New York & New England now enter Boston over the Boston & Albany from Newton, and this line seems to be projected as a substitute for that route.

Toledo, Columbus & Cincinnati.—About eight miles of the extension from Kenton south to a connection with the Cleveland, Cincinnati, Chicago & St. Louis at Ridgeway, O., has been graded, and the track has been laid for nearly this distance. The tracklaying on the balance of the line will probably be finished this month, as nearly all the grading has been completed.

Wheeling Bridge & Terminal Co.—The headings of the tunnel through Chapline Hill in Wheeling, W. Va., west of Wheeling Creek, met early last Friday morning. The tunnel is 2,644 ft. long. Work was begun by the contractors, Paige, Carey & Co., on Dec. 23, 1889. For several months the excavation was carried on on only one end of the tunnel. Since work was commenced at each end an average number of 104 men has been employed night and day. The tunnel is 35 ft. wide and 28 ft. high. With what remains to be removed the amount of rock excavation is 71,063 cu. yds. In arching the tunnel there has been used 7,623,740 ft. of oak timber 12 × 14 in.; 60,000 lbs. of dynamite was used in the work thus far, and 3,400 lbs. of octagon steel for drills. Six men have been killed upon the work. The company has already completed two other tunnels on its line, one 557 ft. long and another 1,203 ft. long. This, with the Chapline Hill tunnel, will make 4,404 ft. of tunneling on the company's line, which is 5.7 miles long.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—The January statement of the entire system, including St. Louis & San Francisco, shows: Gross earnings, $3,087,094, an increase of $255,903; net earnings of $708,884, a decrease of $169,104.

Baltimore & Ohio.—The earning and expenses for February, 1891, compared with February, 1890, were: Earnings, 1890, $1,720,716; 1891, $1,688,773; decrease, $31,943; operating expenses, 1890, $1,352,921; 1891, $1,255,916; decrease, $97,005; net earnings, 1890, $367,795; 1891, $432,857; increase, $65,062. Earnings and expenses for the five months of the fical year 1889-90, compared with the same months of the fiscal year 1889-90, show: Earnings, 1890, $9,988,397; 1891, $9,832,810; decrease, $155,587; operating expenses, 1890, $6,771,144; 1891, $7,051,259; increase, $280,115; net earnings, 1890, $3,217,253; 1891, $2,781,551; decrease, $435,702.

Bedford & Bridgeport.—The trustees will sell the property and franchises of the road in Philadelphia on March 26. The sale will be made under the power given in the mortgage executed May 10, 1872. The road is a leased line of the Pennsylvania and extends from the connection with the Cumberland & Pennsylvania at the Maryland state line to Mt. Dallas, Pa., 39 miles. There is a branch from Bedford to Bolderbaum, 10½ miles.

Buffalo Run, Bellefonte & Bald Eagle.—A bill in equity was filed in Pittsburgh last week in the United States Circuit Court by Charles Breck, of New York, against the company and the Fidelity Insurance Trust & Safe Deposit Co., claiming that the company has defaulted in the payment of the interest on the first mortgage bonds, and asking that a receiver of the railroad be appointed to take possession of the property and that the road be sold.

Central of Georgia.—The lease of the road to the Richmond & West Point Terminal Co., in the name of the Georgia Pacific, is understood to have been practically decided upon at a meeting of the directors in Savannah this week. The lessees will operate the road and assume its indebtedness, and will guarantee to the stockholders seven per cent. on the capital stock, which is $7,500,000.

Chicago, Kansas & Nebraska.—Judge Caldwell, of the United States Circuit Court at Kansas City, has signed the decree of foreclosure in the case of the Chicago, Rock Island & Pacific against this company, and the line is now to be disposed of at public sale to satisfy the Rock Island's mortgage of $28,000,000. When the road was built the Rock Island advanced the money necessary, and issued mortgage bonds on the road bearing interest to be paid under provisions then made. The Rock Island afterward took control of the property, the terms of the lease being that 30 per cent. of the gross earnings be paid to the original stockholders. The counties of Kansas and Nebraska, through which the road was built, voted $3,000,000 in aid of the road and accepted that much stock. The interest on the mortgage bonds became due, and was not paid, and the trustee, the Metropolitan Trust Co., of New York, holding the mortgage, brought suit for foreclosure on the ground of default in the payments of interest. The counties holding stock in the road contested the foreclosure in the United States courts, their case being that the interest was not defaulted, as the Rock Island had not paid the 30 per cent. of the gross earnings as stipulated, but, instead, had paid only a part of the agreed percentage. The Rock Island held that it had paid the full amount, less the operating expenses.

Chicago, Milwaukee & St. Paul.—For the six months ended Dec. 31 the gross earnings were $15,196,420; operating expenses, including taxes, $9,566,521; net earnings, $5,629,899; other income, $22,320; total income, $5,652,219; fixed charges, $3,618,423; balance, $2,033,795. After paying the semi-annual dividend of 3½ per cent. on the preferred stock, requiring $764,396, there is a surplus of $1,269,399.

Covington & Macon.—The transfer of this road to the Richmond Terminal system is expected to be made in a few days. The lease has been approved by the directors of the Richmond & Danville and the Central of Georgia, which are joint guarantors. The bondholders of the leased road have also formally approved the arrangement. The present issue of bonds is to be replaced by a new issue bearing interest at four per cent., which will be guaranteed by the lessees.

Delaware, Maryland & Virginia.—The mortgages of the Junction & Breakwater and Breakwater & Frankford, amounting to $600,000, are now about due. The mortgages are held by the state of Delaware, and by an agreement concluded this week the Delaware, Maryland & Virginia will pay this indebtedness, $51,000 on July 1, $172,333 on Nov. 1, and also $385,000 in 40-year three per cent. bond. These fragments and the bonds of the Delaware, Maryland & Virginia are guaranteed by the Philadelphia, Wilmington & Baltimore.

Georgia, Florida & Southern.—The Seaboard & Roanoke has withdrawn from the agreement to guarantee six per cent. dividends on the stock of this road, in consideration of a long lease, to be given by the Macon Construction Co. Wilbur B. Sparks, the President, has been appointed receiver of both companies, in the suit brought by J. S. McTighe & Co., the sub-contractors, who filed the suit when it was announced that the Seaboard & Roanoke had reconsidered its intention to lease the road.

Illinois Central.—The income from traffic for the eight months ending Feb. 28, 1891 and 1890 (February, 1891, estimated), was as follows:

	1891.	1890.	Inc. or Dec.	
Miles operated	2,875	2,675		
Gross receipts from traf.	$12,158,123	$11,481,984	I.	$676,139
Oper. expen. and taxes.	8,322,883	7,208,798	I.	1,114,085
Net earnings	$3,835,240	$4,273,186	D.	$437,946

Louisville, New Albany & Chicago.—Messrs. Poor & Greenough, of New York, have agreed to pay the floating indebtedness of this road, which amounts to about $2,000,000, being covered by second mortgage five per cent. bonds in the treasury of the company. These bonds, amounting to $2,800,000, will be transferred to Poor & Greenough and the syndicate formed by them, which includes Samuel Thomas and Calvin Brice of the Lake Erie & Western. The arrangement will not be completed until the property has been examined and the financial condition ascertained. Some of the stock of the road will be transferred with the bonds, and probably the present President and a majority of the directors will be succeeded by representatives of the syndicate.

New York & New England.—The gross earnings for January, 1891, were $446,040, and for the same month last year $434,407, an increase of $11,633. In 1891 $267,967 of the earnings were from freight traffic and $147,000 from passengers.

New York Central & Hudson River.—The earnings of the road and its leased lines for the quarter and the nine months to March 31 were as follows, the earnings for 1891 being estimated :

Quarter to March 31 :	1891.	1890.	Inc or dec.
Gross earnings	$8,790,847	$8,573,780	I. $217,067
Operating expenses	5,815,095	5,718,159	I. 96,936
Net earnings	$2,975,752	$2,855,621	I. $120,131
Fixed charges	2,123,100	1,965,420	I. 157,680
Profit	$852,652	$890,201	D. $37.549
Dividend	894,283	894,283	.....
Deficit	$41,631	$4,082	I. $37,549
Nine months to March 31:			
Gross earnings	$27,317.538	$27,850.234	D. $532,696
Operating expenses	18,338,599	18,310,689	I. 27,910
Net earnings	$8,978.939	$9,539,545	D. $560,606
Fixed charges	6,319,500	5,909,121	I. 410,379
Profit	$2,659,439	$3,630,424	D. $970,985
Dividend	2,682,849	3,129,990	D. 447,141
Surplus.....Def.	$23,410	$500,434	D. $523,844

Pittsburgh, Cincinnati, Chicago & St. Louis.—The arbitrators in the action of Robert Sherrard against the consolidated company to fix the valuation of his stock in the Pittsburgh, Cincinnati & St. Louis have rendered their decision. The arbitrators were appointed last July under the act of last winter authorizing stockholders in a proposed consolidation to have the value of their stock fixed by arbitration in case an agreement cannot be made with the consolidated company. The arbitrators' finding is that the actual value of the stock is $60 per share, and they award Sherrard $177,240 for the 2,950 shares held by him.

Rome, Watertown & Ogdensburg.—The entire railroad and property of the company, including its leased lines, was leased in perpetuity on March 13 to the New York Central & Hudson River road, upon terms under which the lessee company absolutely assumes all the fixed charges and liabilities of the road, and guarantees five per cent. dividends per annum on the stock of the company. The directors have declared a stock dividend of 20 per cent. upon the present outstanding capital stock, payable to stockholders of record March 21. The five per cent. guarantee is upon the increased stock, the rental being equivalent to six per cent. upon the present stock.

San Antonio & Aransas Pass.—The reorganization agreement has been signed. Under it there will be one class of bonds only, and two classes of stock, the fixed charges, it is said, having been brought within the present earning capacity of the road. The reorganization provides for completing those portions of lines now under contract and for extinguishing the floating debt and equipment obligations. The floating-debt creditors are parties to the reorganization agreement. A three years' voting trust is provided. The new bonds will bear five per cent. interest, and $14,700,000 will be issued. The non-cumulative stock amounts to $5,250,000, and the common stock, $5,250,000. The floating indebtedness is $3,350,000, which will be cancelled by the sale of new securities.

Texas & Pacific.—The annual report shows gross earnings of $7,327,710 compared with $6,917,802 in 1889; operating expenses, $5,672,344; net earnings, $1,655,365. The net earnings for the previous year were $1,671,744. After deducting interest charges there was a balance of $527,031, against $571,163 the year before. The improvements added to the property amounted to $628,241, $383,000 of which was charged to operating expenses, leaving about $140,000 outstanding to the credit of the income bondholders.

Union Pacific.—The January statement for the entire system shows: Gross earnings, $3,115,376, an increase of $546,088; net earnings, $983,308, an increase of $607,496.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, March 18, 1891.

The Jacksonville Southeastern has not satisfied the Chicago & Alton's demand as to calling in mileage tickets outstanding, and Chairman Finley's decision authorizing the Alton to make a rate of two cents a mile on thousand-mile tickets was issued yesterday. The authority granted applies only to Alton lines in Illinois and to and from St. Louis, however. The ruling is that the two-cent mileage rate may be made between points in Illinois or south of the Atchison, Topeka & Santa Fe, from Chicago to Joliet, the Rock Island from Joliet to Peoria, the Jacksonville Southeastern from Peoria to Jacksonville and the Chicago & Alton from Jacksonville to Pike Junction. The Alton has informed Chairman Finley's office of its desire to appeal from his decision and refer its case to a board of arbitrators to be appointed in the manner provided in the agreement. The Wabash has met the two-cent mileage rate authorized by Chairman Finley, asserting its intention of confining it to Illinois territory, unless extended beyond the state line by the Alton. This, however, is just what the Alton will probably do.

The statements of eastbound freight shipments continue to show that the Chicago & Grand Trunk and the Nickel Plate take a much larger proportion of the tonnage than any of their competitors. It is generally understood that many shippers receive orders from Eastern buyers to forward their grain over the Lackawanna line, of which the Nickel Plate is the Chicago connection; and this is understood to mean that the Lackawanna is influencing business by paying rebates or absorbing lighterage charges in the interest of the consignee who orders the property so routed.

The shipments of flour, grain, and provisions from Chicago to the seaboard last week aggregated 44,131 tons, and the percentages last week and a year ago were as follows: Grand Trunk 27, against 13; Nickel Plate 23, against 8; Michigan Central 16, against 17; Lake Shore 13, against 18; Fort Wayne 9, against 14; Baltimore & Ohio 9, against 20, and Pan Handle 3, against 9. The large Baltimore & Ohio shipments a year ago were owing to an immense export corn business at that time.

Chairman Walker says that there will be no conflict of authority between the new association and the Western Freight Association. The three roads that were parties to the one association and not the other have waived every notice that could in any way interfere with the workings of the two associations.

Chairman Walker has called a meeting of the Board of Commissioners of the Western Traffic Association for next Monday, March 23, to consider a number of matters appealed to it for adjustment. Among the appealed cases are rates on wrought iron from Lake Superior points to Omaha, rates from Chicago and Missouri River points to Beatrice, drayage allowances at Dubuque, divisions with the Pittsburgh, Cincinnati, Chicago & St. Louis, at Chicago, and soft coal rates from interior Illinois mines.

Traffic Notes.

The roads interested have agreed upon a rate of $2 per ton on coal from the Hocking Valley (Ohio) district to Kalamazoo and Grand Rapids, and $1.50 per ton from the Indiana block coal district to the same points. This agreement has been reached after considerable contention about the differential between the two districts.

Certain shippers in the state of Washington complain because the Northern Pacific takes wheat to Chicago for 62½ cents per 100 lbs., while the rate from the same points to the Pacific coast is 32½ cents. Officers of the road say that they load many cars East which otherwise would have to be hauled empty.

The officers of the Jacksonville Southeastern line assert that their through freight tariff from Philadelphia, mentioned last week, has been agreed to by both the Reading and the Atchison, and that the rates to St. Louis are the same as the rates of the other roads to East St. Louis, with the bridge toll added.

A press dispatch states that the Canadian Pacific has sent an Emigration Agent into McPherson County, Dak., with an offer of 160 acres on the line of the road, transportation for families and furniture, and an advance of money for the first year's expenses on 15 year seven per cent. notes.

The American Refrigerator Transit Co. has leased the Union Refrigerator Transit Co. and is now operating the cars of that line, 1,050 in number. It is also operating by temporary arrangement the equipment of the Cold Blast Transportation Co. 250 cars, and has perfected arrangements by which its service will be extended over the Union Pacific system. Various other contracts under consideration will, it is said, probably require the construction of 500 to 1,000 cars within the next few months.

A strong committee, representing the leading passenger associations, took important action on the question of abolishing unlimited tickets at a meeting in New York last Tuesday. A resolution was adopted recommending that, with certain qualifications, the issuing of unlimited tickets for joint business be stopped. The exact provisions of the resolution will not be made public until it has been submitted to the several associations represented. The members of the committee present were Messrs. Scull of the Baltimore & Ohio, Rinearson of the Erie, Daniels of the New York Central, Ford of the Pennsylvania Company, W. E. Davis of the Chicago & Grand Trunk, George W. King of the Michigan Central, James L. Taylor of the Richmond & Danville, E. T. Charlton of the Central of Georgia, Wood of the Pennsylvania, James Charlton of the Chicago & Alton, Sebastian of the Chicago, Rock Island & Pacific, Wishart of the St. Louis & San Francisco, and White of the Atchison, Topeka & Santa Fe.

The abolition of all second class passenger rates is being discussed by the Central Traffic Association roads. As long as second class fares are only about 10 per cent. below the first class, the legitimate demand for the cheaper accommodations seems to continue small, and the practice of permitting holders of second class tickets to ride in first class cars seems to be kept up by some lines with sufficient persistence to produce some little disturbance.

The Executive Committee of the Trunk Line Association met this week, Tuesday, to discuss the exclusion of private stock cars, which the Delaware, Lackawanna & Western has strenuously resisted for a long time. Nothing has yet come of the arbitration, which was the method chosen for disposing of the difficulty. It looks as though private cars might again be admitted into Trunk line territory generally. There was talk at the meeting about the establishment of freight inspection bureaus in New York City and at certain New England points. The New England roads are, as yet, unwilling to stand their share of the expense.

Decision in the Case of Coxe Bros. vs. Lehigh Valley.

The Interstate Commerce Commission on Friday last, in an opinion by Commissioner Morrison, decided the case of Coxe Bros. & Co. against the Lehigh Valley Railroad, which has been pending two years. The principal points decided are as follows:

1. Classification not obligatory on roads, but when misused Commission may correct.

2. Besides terminal expenses, there are other considerations which justify lower proportionate charges for longer distances.

3. Several connecting lines doing through business treated as one in the adjustment of rates.

4. Commission is authorized to determine what rates are reasonable as well as what are unreasonable.

5. The present system of grouping mines in the Lehigh and Mahanoy anthracite coal regions for rates East and West subjects complainants to no undue prejudice.

6. The rates, which are now $1.70, $1.40 and $1.20 per ton on anthracite coal to the Atlantic seaboard, according to sizes, are ordered reduced to $1.50, $1.25 and $1.05.

In the opinion the Commission says:

The complainants submitted for the consideration of the Commission proposed findings of fact in substance as follows:

1. That the Lehigh Valley carries anthracite and bituminous coals over the same distance in the same direction under different classifications, that the tariff sheets and rates applicable to anthracite do not apply to bituminous, and that the two coals are a like kind of freight, and should be classed together as one class of freight.

2. That the acts done by the Lehigh Valley Coal Co., connected with the buying and selling of coal, and the transportation of the same over the road of the Lehigh Valley Railroad Co., are the same as if done by said railroad company, and as done, constitute illegal and unjust discrimination against the complainants [private shippers] and the public generally; and that the proper rate to be paid by all shippers is to be ascertained by deducting from the established rate the loss sustained by said coal company as a buyer of coal for shipment over said railroad.

3. That the average rates per ton per mile charged by the railroad company on anthracite coal are higher than on general freight, and that the rate of $1.80 per ton of 2,240 lbs. to Perth Amboy from the Lehigh coal region, a distance of about 135 miles, is excessive and unreasonable, and should be reduced to what the Commission may decide to be a reasonable rate.

The bituminous coal mines are more than twice as distant as the anthracite mines from New York harbor, while the transportation charges on bituminous are greater in the aggregate, but less per ton per mile. In the last 10 years the price of anthracite in Eastern markets has been maintained and the price of bituminous considerably reduced. Many manufacturers and consumers discontinued the use of anthracite and substituted bituminous, while the complainant and other producers failed to find profitable markets for anthracite.

The complainants insist that the displacement of anthracite by bituminous has deprived them and other miners of hard coal of profitable markets, and that this condition is the result of excessive rates on anthracite and of inequality and discrimination in favor of bituminous; that a readjustment of rates on a basis of the relative distances of the fields of production would reinstate the anthracite in Eastern markets; and that the classification of the two coals as one freight would remove the inequality and discrimination in favor of bituminous and establish all coal charges on a mileage basis, except to the extent that terminal expenses might modify the rate per ton per mile for longer distances.

In the present state of the law classification is not obligatory on the roads. The grounds upon which we are asked to find these two coals to be the same freight, a like kind of traffic, is that they are loaded, unloaded and transported in the same way and substantially at the same expense to the carrier, and are largely used for the same purposes, though one-half or more of the anthracite is used for domestic purposes. The result of classifying and rating all coal, including these lower grades or smaller sizes, as one freight would be that the smaller anthracite coals at the increased rate would be at still greater disadvantage than they now are, and for ordinary steaming would be cut out by the bituminous, while for the uses in which anthracite is indispensable the larger sizes at the same rate would displace the smaller. The consequence would be that 25 per cent. in quantity or about 16 per cent. in present value of all anthracite mined would be unable to bear the burden of transportation, and would be wasted until such time as it could be locally converted into power and the power transmitted. There is, therefore, for the present no hardship, but economy in making the best bear some of the burden of the inferior, which is not a voluntary but a resulting production. Any regulation imposing additional transportation or other burdens on bituminous coal to keep it out of Eastern markets would challenge the wisdom which deposited an abundance of cheap fuel in the east side of the Alleghany Mountain.

It is shown that the railroad company owns the capital stock, property and franchises of the coal company. The same persons are officers of both companies. The authority of this Commission extends to such abuses only as are in conflict with the act to regulate commerce, or some of its provisions. While the coal company may, in the exercise of its chartered rights, buy and sell coal, certainly this Commission cannot determine the prices at which it may buy and sell, so that the railroad company may realize its established freight rates as carrier and suffer no loss as stockholder. The Commission would be incapable of any such determination if it had any authority to make it. Yet the fact that the railroad company directly as a carrier, and indirectly through its coal company as an operator, so conducts the business of buying, shipping, carrying and selling coal that the road realizes less for transportation than its established rates affords evidence of the defendant's readiness to take the freight at less than full charges, and justifies the conclusion that the charges to others are to some extent excessive.

In concluding a long argument on the subject of a reduction of the rates on all sizes of coal to tide-water, the decision says :

"The practicable and necessary adjustment of the rates on such eastbound short-distance traffic, which we have determined upon as reasonable per ton of 2,240 lbs. from the collieries of complainants to Perth Amboy is, on the prepared and larger sizes, $1.50; on pea, $1.25; on buckwheat and culm, $1.05. The charges so adjusted are not meant to affect the charges made to Buffalo and other places."

The rates now determined upon are believed to be liberal for freight so inexpensive as coal, and if, after trial, it is found that they are too high, we will not hesitate to require further reductions; but in view of interests so vast as the eastbound anthracite traffic which may be affected we do not now feel justified in determining upon any lower scale of charges. These rates will be ordered to go into effect April 20, 1891.

The present rates are $1.70 on the prepared and larger sizes; $1.40 on pea and $1.20 on buckwheat and culm.

North Carolina Law Against Scalping.

The Legislature of North Carolina has passed a law making it unlawful for any person to sell or deal in tickets issued by any railroad company, unless he is a duly authorized agent of the road and exhibits his authority; and the company shall be responsible for his acts. Any violation of this law shall be a misdemeanor. When any round-trip ticket is sold it shall be the duty of the road to redeem the unused portion of such ticket by allowing to the legal holder thereof the difference between its cost and the price of a one-way ticket between the stations for which the round-trip ticket was sold. When a one-way or regular ticket is not used by the purchaser it shall be the duty of the road to redeem it at the price paid for it.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, March 14, amounted to 77,693 tons, against 71,814 tons during the preceding week, an increase of 5,879 tons. The proportions carried by each road were :

	Wk. to Mar. 14.		Wk. to Mar. 7.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	9,548	12.3	8,869	12.3
Wabash	3,925	5.0	4,021	5.6
Lake Shore & Michigan South.	10,868	14.0	10,207	14.2
Pitts., Ft. Wayne & Chicago	6,448	8.3	6.860	9.6
Chicago, St. Louis & Pitts.	6,908	8.9	7,257	10.1
Baltimore & Ohio	5,526	7.1	5,060	7.1
Chicago & Grand Trunk	14,325	18.4	13,093	18.2
New York, Chic. & St. Louis	11,736	15.2	8,806	12.3
Chicago & Atlantic	8,366	10.8	7,641	10.6
Total	77,693	100.0	71,814	100.0

Of the above shipments 4,463 tons were flour, 43,022 tons grain, 6,667 tons cured meats, 3,150 tons lard, 6,629 tons dressed beef, 935 tons butter, 800 tons hides, 252 tons wool and 7,190 tons lumber. The three Vanderbilt lines together carried 41.5 per cent., while the two Pennsylvania lines carried but 17.2 per cent.